

101.11.5-4120-287-15

# TM 5-4120-287-15

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

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OPERATOR, ORGANIZATIONAL, DIRECT  
AND GENERAL SUPPORT  
AND DEPOT MAINTENANCE MANUAL

AIR CONDITIONER, BASE-MOUNTED,  
SELF-CONTAINED LIGHTWEIGHT,  
AIR-COOLED, 38,000 BTU/HR COOLING  
AND 35,000 BTU/HR HEATING CAPACITY;  
FAIRCHILD STRATOS MODEL VEA4-3A,  
PN 107201 (FSN 4120-926-4280)

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This copy is a reprint which includes current  
pages from Changes 2 through 5.

HEADQUARTERS, DEPARTMENT OF THE ARMY  
JULY 1968

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## **SAFETY PRECAUTIONS**

The operating voltage of this air conditioner is dangerous to persons coming in contact with any part of the electrical system. Severe, possibly fatal, shock may result. Disconnect the power source before performing any maintenance or inspection, other than operating tests on the air conditioner.

The refrigerant used in the air conditioner (refrigerant-12) is injurious to the eyes and skin. Wear goggles and gloves to avoid injury. If leaks occur in the refrigerant system, immediately and thoroughly ventilate the area.

Purge the system refrigerant charge completely prior to opening the system for maintenance and repair.

Refrigerant-12 decomposes in the presence of fire, forming a toxic gas. Do not release refrigerant when a torch or other flame-producing apparatus is being used.

Do not connect the master power cable unless the master circuit breaker is in the OFF position.

Avoid breathing smoke when using the monobromotrifluoromethane-type fire extinguisher.

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CHANGE }  
NO. 5 }

HEADQUARTERS  
DEPARTMENT OF THE ARMY  
WASHINGTON, D.C., 14 April 1988

Operator, Organizational, Direct Support,  
General Support and Depot Maintenance Manual

AIR CONDITIONER, BASE MOUNTED, SELF-CONTAINED,  
LIGHTWEIGHT, AIR COOLED, 38,000 BTU/HR COOLING AND  
35,000 BTU/HR HEATING CAPACITY (FAIRCHILD-STRATOS  
MODEL VEA4-3A, P/N 107201)  
NSN 4120-00-926-4280

TM 5-4120-287-15, 15 July 1968, is changed as follows:

Page 1-17, figure 1-9, is superseded as follows:

By Order of the Secretary of the Army:

**CARL E. VUONO**  
*General, United States Army*  
*Chief of Staff*

Official:

**R. L. DILWORTH**  
*Brigadier General, United States Army*  
*The Adjutant General*

**DISTRIBUTION:**

To be distributed in accordance with DA Form 12-25A, Operator, Unit, Direct Support and General Support Maintenance Requirements for Air Conditioner, Base Mounted, Air Cooled, Self-Contained, 38,000 BTU Cool/35,000 BTU Heat (VEA4-3A).

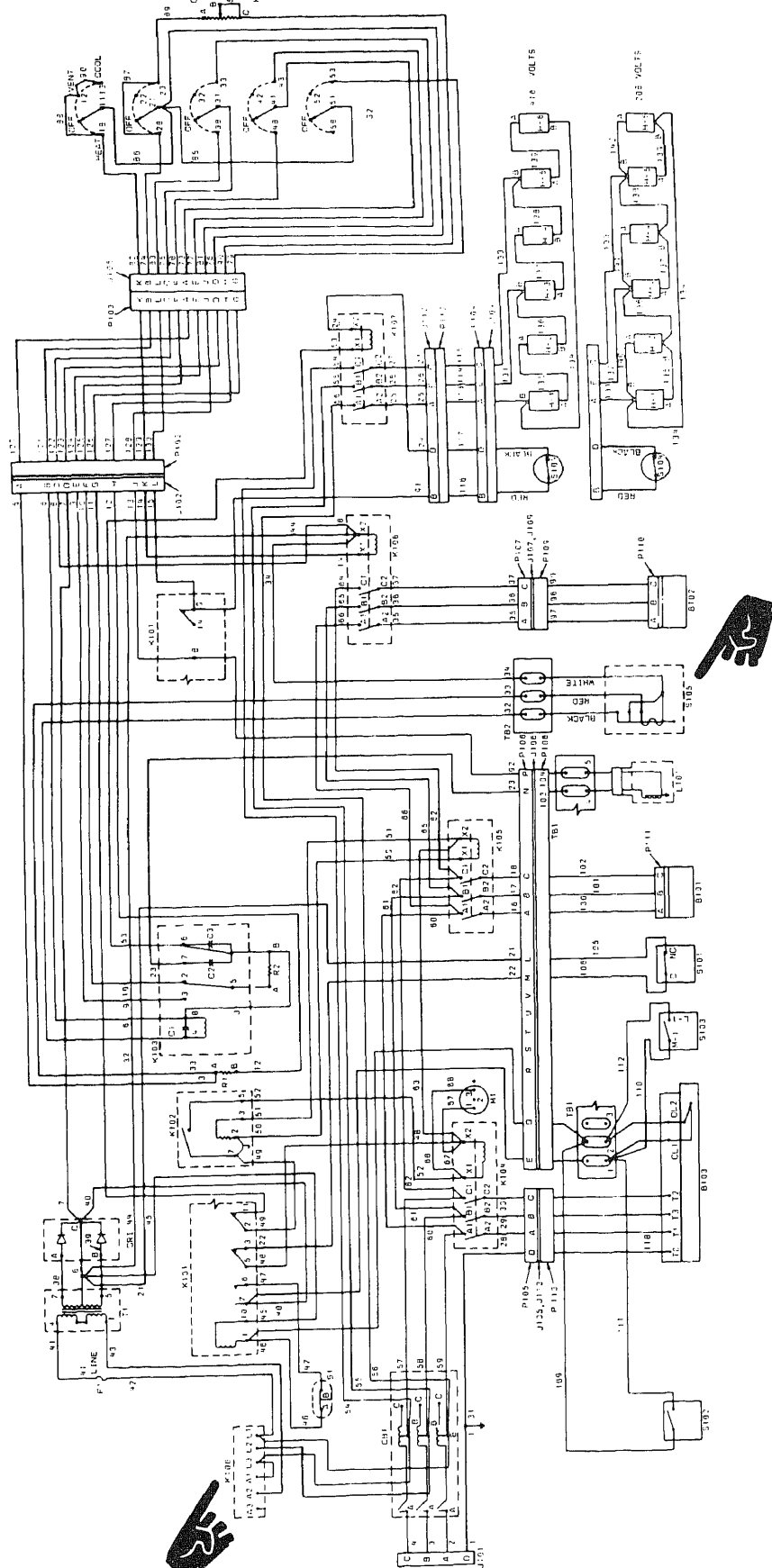


Figure 1-9. Air conditioner electrical system wiring diagram.



CHANGE }  
NO. 4 }

HEADQUARTERS  
DEPARTMENT OF THE ARMY  
WASHINGTON, D.C., 3 July 1978

**Operator, Organizational, Direct Support,  
General Support and Depot Maintenance Manual**  
**AIR CONDITIONER, BASE MOUNTED, SELF-CONTAINED,  
LIGHTWEIGHT, AIR COOLED, 38,000 BTU/HR COOLING AND  
35,000 BTU/HR HEATING CAPACITY (FAIRCHILD-STRATOS  
MODEL VEA4-3A, P/N 107201)  
NSN 4120-00-926-4280**

TM 5-4120-287-15, 15 July 1968, is changed as follows:

*Page 1-1.* Paragraph 1-1d, lines 6 thru 9, change to read: "forward direct to Commander, U. S. Army Troop Support and Aviation Materiel Readiness Command, ATTN: DRSTS-MTPS, 4300 Goodfellow Boulevard, St. Louis, Missouri 63120.

*Page 1-11.* Paragraph 1-4b. (18), line 4, change model number FR-3S-ND-28 to FR3SNO28.

*Page 1-17.* Figure 1-9, make the following changes:

(1) T1 pin 6 is shown connected to pin C of CR1 (top, left). Delete this connection.

(2) K108 does not have a wire on pin A3 as shown. The wire shown as pin A3 should go to pin A1.

(3) Contacts between overloads OL1 and OL2 are incorrectly shown in the normally closed position, mark these contacts normally open (NO).

*Page 6-1.* Table 6-1, make the following changes:

(1) The continuity check between pins A-E should indicate continuity (C) when the switch is set to the "COOL" position.

(2) Add continuity check for pins G-D. Continuity should be present in the "COOL" position and open (O) in the other positions.

*Page 6-5.* Paragraph 6-6c, after last sentence add:

A replacement pressure switch may be supplied without capillary tubes. This type pressure switch would contain 1/4 inch male flare connections and can be installed by utilizing existing capillary tubes from the original pressure switch as follows:

(1) Discharge the refrigerant system (para 7-7).

(2) Cut capillary tubes close to base of original pressure switch leaving other ends brazed in place on the respective high and low refrigerant line tee fittings.

(3) Braze a short piece of 1/4 inch O. D. copper tubing, approximately 2 inches long, to cut end of each capillary tube.

(4) Install 1/4 inch flare nut on each capillary tube and flare ends of copper tubing added in step (3) above. The flare nuts and capillary tubes will remain permanently installed on the refrigerant lines.

(5) Connect capillary tubes to their respective high and low outlet on new pressure switch.

(6) Refer to Chapter 7, leak test, evacuate, add compressor lubricating oil, and charge refrigerant system.

y Order of the Secretary of the Army:

fficial:

**BERNARD W. ROGERS**  
*General, United States Army*  
*Chief of Staff*

**J. C. PENNINGTON**

*Brigadier General, United States Army*  
*The Adjutant General*

istribution:

To be distributed in accordance with DA Form 12-25C, Operator maintenance requirements for Air Conditioners, 38,000 BTU.

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TM 5-4120-287-15

C 3

CHANGE }  
 No. 3 }

HEADQUARTERS  
 DEPARTMENT OF THE ARMY  
 WASHINGTON, DC, 15 March 1975

**Operator, Organizational, Direct Support,  
 General Support and Depot Maintenance Manual  
 AIR CONDITIONER, BASE MOUNTED, SELF-CONTAINED,  
 LIGHTWEIGHT, AIR COOLED, 38,000 BTU/HR COOLING AND  
 35,000 BTU/HR HEATING CAPACITY (FAIRCHILD-STRATOS  
 MODEL VEA4-3A, P/N 107201)  
 NSN 4120-00-926-4280**

TM 5-4120-287-15, 15 July 1968, is changed as follows:

Title is changed as shown above.

*Page 2 of cover.* Add the following warning to the list of safety precautions:

*Page 7-6, paragraph 7-14a.* Add the following warning.

**WARNING**

The burning of polyurethane foams is dangerous. Due to the chemical composition of a polyurethane foam, toxic fumes are released when it is burned or heated. If it is burned or heated indoors, such as during a welding operation in its proximity, precautions should be taken to adequately ventilate the area. An exhaust system equivalent to that of a paint spray booth should be used. Air supplied respirators, approved by the National Institute for Occupational Safety and Health or the US Bureau of Mines, should be used for all welding in confined spaces and when ventilation is inadequate. Individuals who have chronic or recurrent respiratory conditions, including allergies and asthma, should not be employed in this type of environment.

**WARNING**

The burning of polyurethane foams is dangerous. Due to the chemical composition of a polyurethane foam, toxic fumes are released when it is burned or heated. If it is burned or heated indoors, such as during a welding operation in its proximity, precautions should be taken to adequately ventilate the area. An exhaust system equivalent to that of a paint spray booth should be used. Air supplied respirators, approved by the National Institute for Occupational Safety and Health or the US Bureau of Mines, should be used for all welding in confined spaces and when ventilation is inadequate. Individuals who have chronic or recurrent respiratory conditions, including allergies and asthma, should not be employed in this type of environment.

Order of the Secretary of the Army:

FRED C. WEYAND  
*General, United States Army*  
*Chief of Staff*

icial:

VERNE L. BOWERS  
*Major General, United States Army*  
*The Adjutant General*

tribution:

To be distributed in accordance with DA Form 12-25C (qty rqr block No. 566), organizational  
maintenance requirements for Environmental Equipment, Air Conditioners, 38,000 BTU.

Change }  
No. 2 }

HEADQUARTERS  
DEPARTMENT OF THE ARMY  
Washington, D C, 19 April 1973

**Operator, Organizational, Direct Support, General  
Support, and Depot Maintenance Manual  
AIR CONDITIONER, BASE-MOUNTED, SELF-CONTAINED,  
LIGHTWEIGHT, AIR-COOLED, 38,000 BTU/HR  
COOLING AND 35,000 BTU/HR HEATING CAPACITY;  
(FAIRCHILD-STRATOS MODEL VEA4-3A, PN107201)  
FSN 4120-926-4280**

TM 5-4120-287-15, 15 July 1968, is changed as follows:

*Page 1-1.* Paragraph 1-1 is superseded as follows:

### 1-1. Scope

*a.* This manual is for your use in operating and maintaining the air conditioner.

*b.* The reporting of errors, omissions, and recommendations for improving this publication by the individual user is encouraged. Reports should be submitted on DA Form 2028 (Recommended Changes to Publications) and forwarded direct to: Commander, US Army Mobility Equipment Command, ATTN: AMSME-MPP, 4300 Goodfellow

Boulevard, St. Louis, MO 63120. A reply will be furnished directly to you. Paragraph 1-2 is superseded as follows:

### 1-2. Maintenance Forms and Records

Maintenance forms and records that you are required to use are explained in TM 38-750.

*Page 1-17,* figure 1-9. In the bottom center of the illustration, "S101" is changed to read "S105".

*Page 3-2,* paragraph 3-6. In line 3, "figure 3-1" is changed to read "table 3-1".

Paragraph 3-7b. In line 3, "figure 3-2" is changed to read "table 3-2".

Table 3-1 is added as follows:

*Table 3-1. Operator/Crew Preventive Maintenance Checks and Services*

*W—Weekly*

<i>Interval and Sequence No.</i>		<i>Item to be Inspected Procedure</i>
<i>D</i>	<i>W</i>	
1		REFRIGERANT LIQUID SIGHT GLASS Inspect refrigerant condition at sight glass for condition of refrigerant in system while unit is operating with air conditioning switch in cool, and temperature control set in MAXIMUM COOL position. Milky flow indicates moisture, bubbles indicate low charge. Report either condition to organizational maintenance.
2		FILTER CLEAN INDICATORS Inspect filter clean indicators while air conditioning is operating. Clean or replace filter when indicator ball rises to SERVICE position (paras 3-11, 3-12).
3		FUSE INDICATOR Indicator will glow if fuse is defective. Replace defective fuse (para 3-9).
4		CONTROLS AND INSTRUMENTS Inspect controls and instruments for loose mounting and any damage that would affect operation of controls.

\*This change supersedes C1, 17 May 1972.

Q-Quarterly

Sequence Number	Item To Be Inspected Procedure	Work Time (M/H)
1	EVAPORATOR BLOWER WHEEL Inspect blower wheel for accumulation of dirt or lint on wheel blades. Clean wheel with brush.	
2	EVAPORATOR ASSEMBLY AND MIST ELIMINATOR Inspect evaporator coil and mist eliminator for accumulation of dirt clogging air flow. Clean evaporator coils and fins with soft brush and compressed air. Wash mist eliminator with water.	
3	CONDENSER ASSEMBLY Inspect condenser coil and fins for accumulation of dirt and lint. Clean condenser coils and fins with soft brush and compressed air.	
4	CONTROLS AND INSTRUMENTS Inspect controls and instruments on electrical tray panel and remote control box for operation.	

Pages 3-3 and 3-4. Figure 3-1 is rescinded.

Pages 3-5 and 3-6. Figure 3-2 is rescinded.

Page 6-1. In table 6-1, line AE, "0-0-0-0" is changed to read "0-0-0-C".

Page 6-5, paragraph 6-6e (1). In line 3, "TB 1" is changed to read "TB 2".

Page B-1. Appendix B is superseded as follows:

APPENDIX B

BASIC ISSUE ITEM LIST AND ITEMS TROOP INSTALLED OR AUTHORIZED

Section I. INTRODUCTION

B-1. Scope

This appendix lists basic issue items, items troop installed or authorized which accompany the air conditioner and are required by the crew/operator for operation, installation, or operator's maintenance.

B-2. General

This basic issue items, items troop installed or authorized list is divided into the following sections:

a. Basic Issue Items List—Section II. Not applicable.

b. Items Troop Installed or Authorized List—Section III. A list in alphabetical sequence of items which, at the discretion of the unit commander, may accompany the end item, but are NOT subject to be turned in with the end item.

B-3. Explanation of Columns

The following provides an explanation of columns

in the tabular list of Basic Issue Items List, Section II, and Items Troop Installed or Authorized, Section III.

a. Source, Maintenance, and Recoverability Code(s) (SMR): Not applicable.

b. Federal Stock Number. This column indicates the Federal stock number assigned to the item and will be used for requisitioning purposes.

c. Description. This column indicates the Federal item name and any additional description of the item required.

d. Unit of Measure (U/M). A 2-character alphabetic abbreviation indicating the amount or quantity of the item upon which the allowances are based, e.g., ft, ea, pr, etc.

e. Quantity Authorized (Items Troop Installed or Authorized Only). This column indicates the quantity of the item authorized to be used with the equipment.

# Section III. ITEMS TROOP INSTALLED OR AUTHORIZED LIST

(1) SMR Code	(2) Federal stock Number	(3) Description  Ref No. & Mfr code	(4) Unit of meas  Usable on code	(5) Qty auth
	7520-559-9618 4130-860-0042	CASE, MANUAL OIL FILTER: Water Soluble	EA EA	1 1

By Order of the Secretary of the Army:

CREIGHTON W. ABRAMS  
*General, United States Army*  
*Chief of Staff*

Official:

VERNE L. BOWERS

*Major General, United States Army*  
*The Adjutant General*

Distribution:

To be distributed in accordance with DA Form 12-25C (qty rqr block No. 566) Organizational Maintenance requirements for Air Conditioners: 38,000 BTU.



OPERATOR, ORGANIZATIONAL, DIRECT AND GENERAL SUPPORT  
AND DEPOT MAINTENANCE MANUALAIR CONDITIONER, BASE-MOUNTED, SELF-CONTAINED  
LIGHTWEIGHT, AIR-COOLED, 38,000 BTU/HR COOLING  
AND 35,000 BTU/HR HEATING CAPACITY;  
FAIRCHILD STRATOS MODEL VEA4-3A,  
PN 107201 (FSN 4120-926-4280)

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# CHAPTER 1

## INTRODUCTION

### Section I. GENERAL

#### 1-1. Scope

a. These instructions are published for use by personnel to whom the air conditioner, base-mounted, self-contained, lightweight, air cooled, 38,000 BTU/hr (British Thermal Units per hour) cooling and 35,000 BTU/hr heating capacity, Model VEA4-3A (manufactured by Stratos Division, Fairchild Hiller Corporation, Bay Shore, New York) is issued. The equipment will hereafter be referred to as the air conditioner. Chapters 1 through 3 provide information on operation, preventive maintenance services, and organizational maintenance of equipment, accessories, components, and attachments. Chapter 4 provides information for direct and general support and depot maintenance. Also included are descriptions of main units and their functions in relationship to other components.

b. Appendix A contains a list of publications applicable to this manual. Appendix B contains the list of basic issue items authorized the operator of this equipment and the list of maintenance and operating supplies required for initial operation. Appendix C contains the maintenance allocation chart. Organizational, direct and general support and de-

pot maintenance repair parts and special tools are listed in TM 5-4120-287-25P.

c. Numbers in parentheses following nomenclature callouts on illustrations indicate quantity; numbers preceding nomenclature callouts indicate preferred sequence.

d. Report of errors, omissions, and recommendations for improving this publication by the individual user is encouraged. Reports should be submitted on DA Form 2028 (Recommended Changes to DA Publications) and forwarded direct to Commanding General, U.S. Army Mobility Equipment Command, ATTN: AMSME-MPP, 4300 Goodfellow Boulevard, St. Louis, Mo. 63120.

#### 1-2. Record and Report Forms

a. DA Form 2258 (Depreservation Guide for Vehicles and Equipment).

b. For other record and report forms applicable to operator, crew, organizational maintenance, direct and general support and depot maintenance, refer to TM 38-750.

*Note.* Applicable forms, excluding Standard Form 46 (United States Government Motor Vehicles Operator's Identification Card) which is carried by the operator, shall be kept in a canvas bag mounted on equipment.

### Section II. DESCRIPTION AND TABULATED DATA

#### 1-3. Description

a. *General.* The air conditioning unit (figs. 1-1 and 1-2) is a lightweight, air transportable, vapor cycle air conditioning package specifically designed to provide conditioned air for guided missile ground support shelters. This unit may also be utilized in other

vehicles having similar personnel and equipment cooling requirements. After initial installation on a trailer or in a shelter, the unit is capable of an air cooling load capacity of 38,000 BTU/hr utilizing a 416-volt, 6-pole motor, 7700 rpm (revolutions per minute), 8-hp (horsepower) motor compressor. The unit has

a heating capacity of 35,000 BTU/hr (10.5 kw (kilowatts)). The air conditioning unit is contained in a single enclosure of compact sturdy construction built to rigid military specifications and standards. The enclosure is subdivided into a condenser section and evaporator section. The condenser section contains the compressor, condenser fan, and high pressure refrigerant controls. The evaporator section contains the evaporator, evaporator fan, expansion valve, heaters, electrical controls, and temperature controls. Functionally, the air conditioning unit consists of a cooling subsystem and a heating subsystem regulated by either automatic or manual controls from a remote control box.

*b. Electrical Tray Assembly.* The electrical tray assembly (fig. 1-3) contains the electrical power controls and relays. The front panel of the electrical tray assembly contains the circuit breaker, the system reset push button, the hourmeter, the control circuit fuse, the main power connector, and the remote control box assembly connector. Mounted within the electrical tray assembly are the motor control relays, the temperature control relays, the transformer, the phase sequence relay, and the rectifier. The 28-vdc (volts direct current) power required for the operation of the relays is obtained from the transformer and the rectifier.

*c. Remote Control Box Assembly.* The remote control box assembly (fig. 1-1) contains the operating controls for the air conditioning unit. Mounted on the front panel is a four-position (HEAT, OFF, VENT, COOL) five-deck switch and a temperature control variable resistor (minimum setting COOL; maximum setting HEAT). The rheostat dial is continuously variable between the COOL and WARM positions, which corresponds to a return air temperature range of 60F to 90F.

*d. Motor-compressor.* The motor-compressor (fig. 1-4) consists of positive-displacement compressor which is directly driven by an integral 8-hp, 416-volt, 400-cycle, 3-phase, 4-wire induction motor with a designed speed of 7700 rpm. The compressor draws low pressure refrigerant vapor from the evaporator

and compresses it to a high pressure, high temperature refrigerant vapor. The motor-compressor runs continuously when the air conditioner is operating in the COOL mode.

*e. Thermostat.* The thermostat (fig. 1-3) is located in the evaporator compartment. The thermostat senses the temperature of the air entering the evaporator and provides control signals to maintain desired temperatures.

*f. High-low Pressure Cut-out Switch.* The high-low pressure cut-out switch (fig. 1-4) is a dual single pole, single-throw switch which protects the cooling system from excessive compressor discharge pressure and low compressor inlet pressure. The high pressure side of the switch is connected into the compressor discharge line; the low pressure side into the compressor inlet line. The switch has a rating of 2 amperes at 28 vdc. The high pressure side is set to close the switch (energizing the trip relay, which removes power from the compressor) when the pressure in the compressor discharge line increases to 260 to 265 psig (pounds per square inch gage). The switch will automatically reset when the discharge line pressure decreases to 200 to 220 psig. The low pressure side is set to close the switch when the pressure in the compressor inlet line decreases to 20 to 21 psig. The switch will automatically reset when the inlet line pressure increases to 30 to 40 psig. The system trip relay is reset by pressing the system RESET switch (fig. 1-3).

*g. Condenser Fan.* The condenser fan assembly (fig. 1-5) provides cooling air for the condenser. As supplied, it is complete with its own bearings and seals and is permanently lubricated. The fan is a high speed (5800 rpm) continuous duty, vane-axial type with a self-contained motor for use on 416-volt, 3-phase, 400-cycle, 4-wire power. The condenser fan is rated at 4120 SCFM (Standard Cubic Feet/Minute). The fan motor is constructed with an internal automatic reset thermal and overcurrent protector.

*Note.* The condenser fan discharge door must be open when unit is operating in cooling cycle. A Microswitch, activated by the door, prevents operation of compressor motor and condenser fan motor if door is closed.

#### *h. Condenser-subcooler Assembly.*

(1) *Condenser subassembly.* The condenser (fig. 1-4) is a crossflow-type heat exchanger of copper tube and aluminum fin construction. The condenser rejects the heat absorbed by the refrigerant in the evaporator and the heat of compression added by the compressor; thereby transforming the refrigerant vapor into a liquid. The liquid refrigerant is then passed from the condenser outlet to the receiver inlet.

(2) *Subcooler subassembly.* The subcooler (fig. 1-4) is integral with the condenser, and is cooled by air drawn across it by the condenser fan. The subcooler, located in the line between the receiver and the filter drier, lowers the refrigerant temperature approximately 8°F; and thereby prevents flashback (vaporization) of the liquid refrigerant before it passes through the expansion valve.

*i. Low Ambient Switch.* The low ambient temperature switch (fig. 6-2) located in the condenser air inlet stream closes when the ambient air temperature falls below 40°F; causing the cooling cycle to cease by de-energizing the motor compressor and condenser fan motor. The evaporator fan motor continues to operate, recirculating the shelter air and/or drawing in fresh air. When ambient temperature rises above 50°F, the low ambient temperature switch opens; then upon pressing the system reset switch, the cooling cycle resumes.

*j. Receiver.* The receiver, located between the condenser and the subcooler (fig. 1-4), stores condensed (liquified) refrigerant. This stored liquid refrigerant acts as a seal between the partial vapor-liquid state in the condenser and the liquid supply to the evaporator expansion valve.

*k. Hot Gas Bypass Valve.* The hot gas bypass valve (fig. 1-4) regulates the compressor inlet pressure. It consists of a housing with a replaceable power unit. The power unit contains a spring and diaphragm which actuate the valve mechanism. Three tube connections on the housing accommodate the inlet and outlet lines and the pressure equalizing line which is connected to the compressor inlet

line. The valve maintains a minimum compressor inlet pressure of 28 psig during light-load operation; thus preventing evaporator air side freeze-up. This function is accomplished by passing compressor discharge gas into the compressor inlet line.

*l. Filter-drier.* The filter-drier (fig. 1-4) consists of a sheet metal housing with 1/2-inch flared inlet and outlet connections. The unit contains a conical filter screen, the base of which is mounted to a fiber glass pad at the outlet end of the housing. Within the housing, both inside and outside the cone screen, is the drying agent (desiccant), which is cast in the form of 1/8-inch balls of activated aluminum. (The filter-drier is installed directly in the liquid-refrigerant line between the subcooler subassembly and the refrigerant solenoid valve.) It is used to remove entrained moisture, sludge, dirt, and other foreign particles from the liquid refrigerant. The filter-drier is a throwaway unit which must be replaced when the refrigerant charge is replaced and/or when the system has been subjected to extensive maintenance or servicing.

*m. Solenoid Valve.* The solenoid valve (fig. 1-4) is an electrically operated, thermostatically controlled shutoff valve located in the liquid refrigerant line between the filter-drier and the expansion valve. When the solenoid valve is closed, refrigerant flow to the expansion valve is stopped and compressor discharge gas is bypassed to the compressor suction inlet) line through the hot gas bypass valve. When the air conditioner is operating in the cooling mode the compressor operates continuously. Air temperature regulation is accomplished by the thermostatically controlled opening and closing of the solenoid valve.

*n. Refrigerant Liquid Sight Indicator.* The refrigerant liquid sight indicator (fig. 1-2), installed upstream of the expansion valve, can be viewed through a port in the air conditioner rear wall. The indicator consists of a metal body with 1/2-inch inlet and outlet connections; and a glass viewing window, permitting visual indication of adequate liquid refrigerant flow to the thermostatic expansion valve. The system moisture content indicator,

a heating capacity of 35,000 BTU/hr (10.5 kw (kilowatts)). The air conditioning unit is contained in a single enclosure of compact sturdy construction built to rigid military specifications and standards. The enclosure is subdivided into a condenser section and evaporator section. The condenser section contains the compressor, condenser fan, and high pressure refrigerant controls. The evaporator section contains the evaporator, evaporator fan, expansion valve, heaters, electrical controls, and temperature controls. Functionally, the air conditioning unit consists of a cooling subsystem and a heating subsystem regulated by either automatic or manual controls from a remote control box.

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and compresses it to a high pressure, high temperature refrigerant vapor. The motor-compressor runs continuously when the air conditioner is operating in the COOL mode.

*e. Thermostat.* The thermostat (fig. 1-3) is located in the evaporator compartment. The thermostat senses the temperature of the air entering the evaporator and provides control signals to maintain desired temperatures.

*f. High-low Pressure Cut-out Switch.* The high-low pressure cut-out switch (fig. 1-4) is a dual single pole, single-throw switch which protects the cooling system from excessive compressor discharge pressure and low compressor inlet pressure. The high pressure side of the switch is connected into the compressor discharge line; the low pressure side into the compressor inlet line. The switch has a rating of 2 amperes at 28 vdc. The high pressure side is set to close the switch (energizing the trip relay, which removes power from the compressor) when the pressure in the compressor discharge line increases to 260 to 265 psig (pounds per square inch gage). The switch will automatically reset when the discharge line pressure decreases to 200 to 220 psig. The low pressure side is set to close the switch when the pressure in the compressor inlet line decreases to 20 to 21 psig. The switch will automatically reset when the inlet line pressure increases to 30 to 40 psig. The system trip relay is reset by pressing the system RESET switch (fig. 1-3).

*g. Condenser Fan.* The condenser fan assembly (fig. 1-5) provides cooling air for the condenser. As supplied, it is complete with its own bearings and seals and is permanently lubricated. The fan is a high speed (5800 rpm) continuous duty, vane-axial type with a self-contained motor for use on 416-volt, 3-phase, 400-cycle, 4-wire power. The condenser fan is rated at 4120 SCFM (Standard Cubic Feet/Minute). The fan motor is constructed with an internal automatic reset thermal and overcurrent protector.

*Note.* The condenser fan discharge door must be open when unit is operating in cooling cycle. A Microswitch, activated by the door, prevents operation of compressor motor and condenser fan motor if door is closed.

### *h. Condenser-subcooler Assembly.*

(1) *Condenser subassembly.* The condenser (fig. 1-4) is a crossflow-type heat exchanger of copper tube and aluminum fin construction. The condenser rejects the heat absorbed by the refrigerant in the evaporator and the heat of compression added by the compressor; thereby transforming the refrigerant vapor into a liquid. The liquid refrigerant is then passed from the condenser outlet to the receiver inlet.

(2) *Subcooler subassembly.* The subcooler (fig. 1-4) is integral with the condenser, and is cooled by air drawn across it by the condenser fan. The subcooler, located in the line between the receiver and the filter drier, lowers the refrigerant temperature approximately 8°F; and thereby prevents flashback (vaporization) of the liquid refrigerant before it passes through the expansion valve.

*i. Low Ambient Switch.* The low ambient temperature switch (fig. 6-2) located in the condenser air inlet stream closes when the ambient air temperature falls below 40°F; causing the cooling cycle to cease by de-energizing the motor compressor and condenser fan motor. The evaporator fan motor continues to operate, recirculating the shelter air and/or drawing in fresh air. When ambient temperature rises above 50°F, the low ambient temperature switch opens; then upon pressing the system reset switch, the cooling cycle resumes.

*j. Receiver.* The receiver, located between the condenser and the subcooler (fig. 1-4), stores condensed (liquified) refrigerant. This stored liquid refrigerant acts as a seal between the partial vapor-liquid state in the condenser and the liquid supply to the evaporator expansion valve.

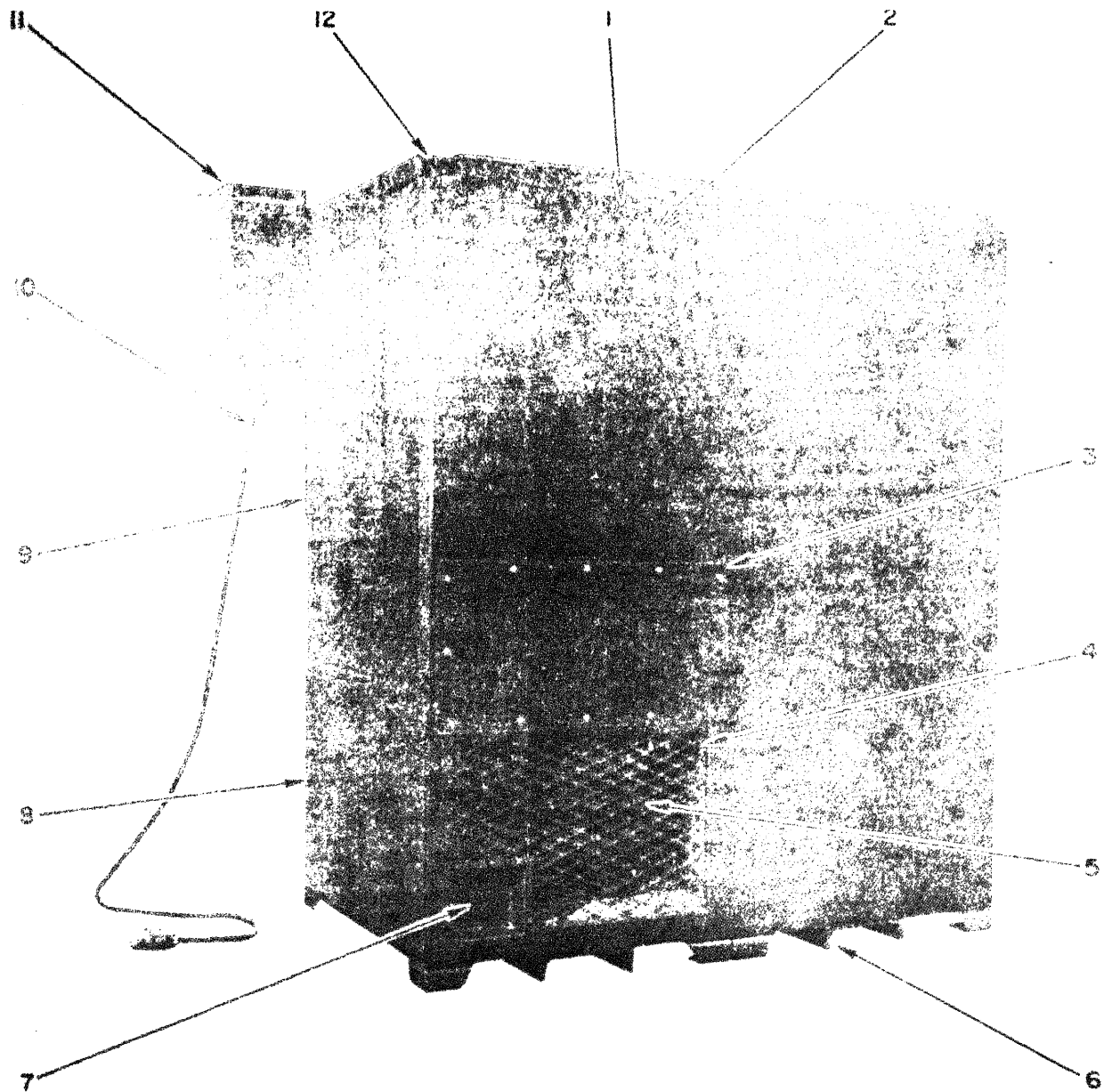
*k. Hot Gas Bypass Valve.* The hot gas bypass valve (fig. 1-4) regulates the compressor inlet pressure. It consists of a housing with a replaceable power unit. The power unit contains a spring and diaphragm which actuate the valve mechanism. Three tube connections on the housing accommodate the inlet and outlet lines and the pressure equalizing line which is connected to the compressor inlet

line. The valve maintains a minimum compressor inlet pressure of 28 psig during light-load operation; thus preventing evaporator air side freeze-up. This function is accomplished by passing compressor discharge gas into the compressor inlet line.

*l. Filter-drier.* The filter-drier (fig. 1-4) consists of a sheet metal housing with 1/2-inch flared inlet and outlet connections. The unit contains a conical filter screen, the base of which is mounted to a fiber glass pad at the outlet end of the housing. Within the housing, both inside and outside the cone screen, is the drying agent (desiccant), which is cast in the form of 1/8-inch balls of activated aluminum. (The filter-drier is installed directly in the liquid-refrigerant line between the subcooler subassembly and the refrigerant solenoid valve.) It is used to remove entrained moisture, sludge, dirt, and other foreign particles from the liquid refrigerant. The filter-drier is a throwaway unit which must be replaced when the refrigerant charge is replaced and/or when the system has been subjected to extensive maintenance or servicing.

*m. Solenoid Valve.* The solenoid valve (fig. 1-4) is an electrically operated, thermostatically controlled shutoff valve located in the liquid refrigerant line between the filter-drier and the expansion valve. When the solenoid valve is closed, refrigerant flow to the expansion valve is stopped and compressor discharge gas is bypassed to the compressor suction inlet) line through the hot gas bypass valve. When the air conditioner is operating in the cooling mode the compressor operates continuously. Air temperature regulation is accomplished by the thermostatically controlled opening and closing of the solenoid valve.

*n. Refrigerant Liquid Sight Indicator.* The refrigerant liquid sight indicator (fig. 1-2), installed upstream of the expansion valve, can be viewed through a port in the air conditioner rear wall. The indicator consists of a metal body with 1/2-inch inlet and outlet connections; and a glass viewing window, permitting visual indication of adequate liquid refrigerant flow to the thermostatic expansion valve. The system moisture content indicator,



HEIGHT 49.0 INCHES  
 LENGTH 40.0 INCHES  
 WIDTH 24.0 INCHES  
 WEIGHT 375.0 INCHES

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*Figure 1-1. Air conditioner, three quarter, left-front view.*



- |                                         |                                              |
|-----------------------------------------|----------------------------------------------|
| 1 Conditioned air outlet port           | 7 Vent air door control knob                 |
| 2 Heater bank assembly (2)              | 8 Evaporator blower access panel assembly    |
| 3 Electrical tray access panel assembly | 9 Evaporator left-side access panel assembly |
| 4 Recirculating air inlet port          | 10 Remote control harness assembly           |
| 5 Recirculating air door                | 11 Remote control box assembly               |
| 6 Fork lift channel (2)                 | 12 Lifting eye (4)                           |

Figure 1-1—Continued.

located within the glass viewing window, changes from green to yellow as the system moisture content becomes critical. System moisture content in excess of 15 ppm (parts per million) is considered critical.

#### *o. Thermostatic Expansion Valve.*

(1) The thermostatic expansion valve (fig. 1-6) is utilized to regulate liquid refrigerant flow to the evaporator. It is the dividing point between the high and low pressure sides of the system. The valve responds to the temperature of the refrigerant vapor leaving the evaporator; and regulates the amount of refrigerant entering the evaporator in exact proportion to the rate of evaporation of the liquid refrigerant in the evaporator. This controlled flow prevents the return of liquid refrigerant to the compressor.

(2) The valve consists of a body flange mounted on the inlet side of the evaporator, a cage assembly, and a power assembly with a remote temperature-sensing bulb which is clamped on the suction line leaving the evaporator. The power assembly contains a diaphragm, diaphragm chamber, capillary tube connection for the remote bulb, and a port for the external equalizing line. The remote temperature-sensing bulb, capillary tube, and the chamber formed by the diaphragm comprise a closed system which is charged with a volatile fluid. An external equalizer line is connected to the evaporator outlet. The cage assembly contains a valve pin and the superheat adjusting spring.

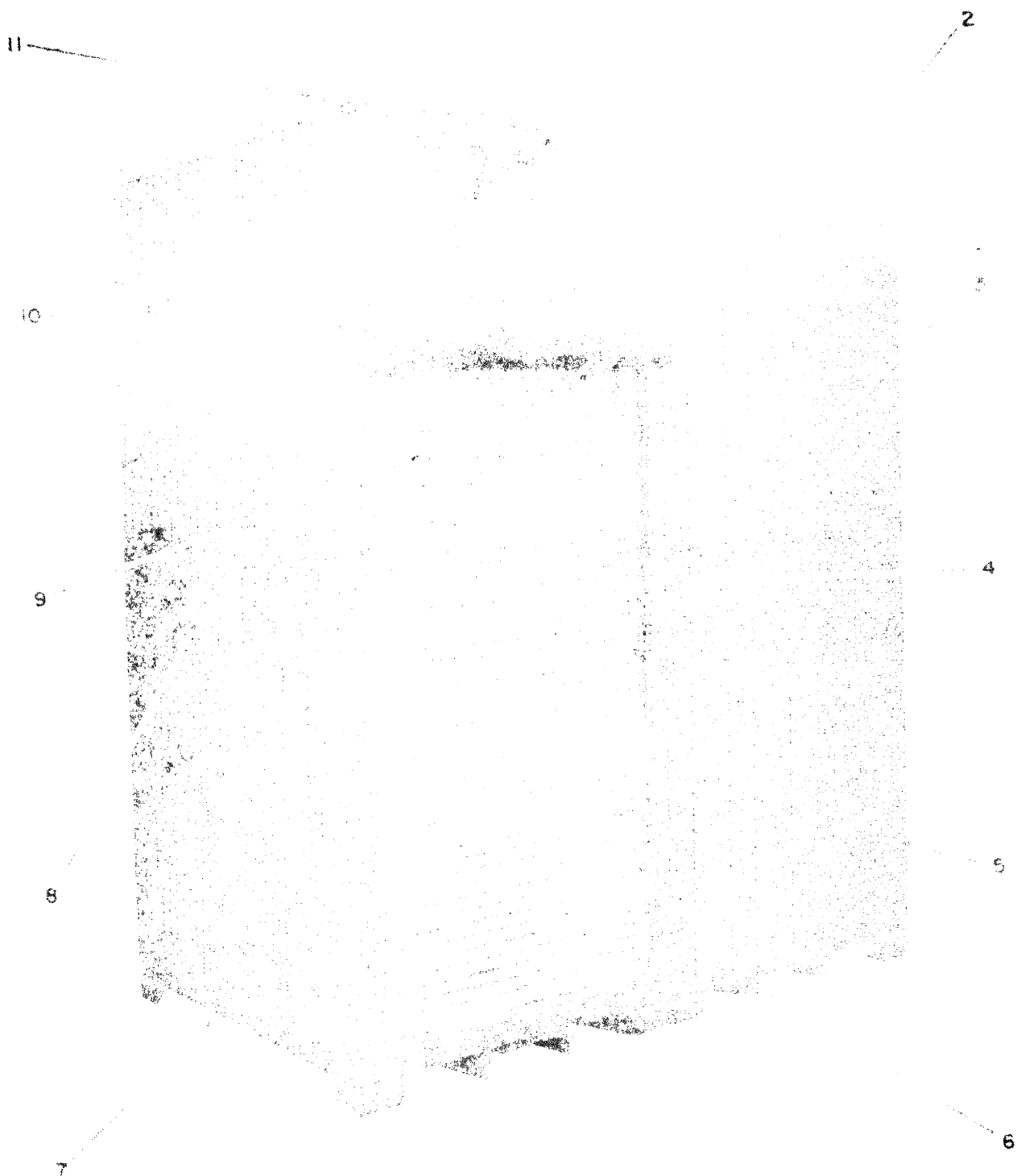
*p. Evaporator Assembly.* The evaporator assembly (fig. 1-7) consists of an evaporator cooling coil and refrigerant distributor. The evaporator is a 13 circuit, direct expansion coil of aluminum fin and copper tube construction. It removes heat from the air being conditioned by vaporization of the liquid

refrigerant flowing through it. In order to assure efficient use of this multicircuited coil a distributor is used to direct equal amounts of refrigerant to each individual coil circuit. The unit is of cross-counterflow design with both air and refrigerant flowing in a horizontal plane.

*q. Evaporator Blower.* The evaporator blower (fig. 1-7) directs the air to be conditioned through the evaporator where it is cooled. As supplied, the evaporator fan is complete with scroll, wheel and inlet rings; and is rated at 1200 SCFM. It is a medium speed (3750 rpm), double inlet centrifugal blower with a continuous duty direct coupled motor. The evaporator fan operates on 416-volt, 3-phase, 400-cycle, 4-wire power. The motor is designed with inherent thermal and over-current protection and permanently lubricated sealed bearings.

*r. Pressure Relief Valve.* The pressure relief valve (fig. 1-4) is a straight through type valve, located in the refrigerant liquid line, downstream from the filter-drier. It functions to protect the system components from high internal pressure, resulting from possible malfunctions of the system or its components, by discharging the high pressure refrigerant to the atmosphere. The valve consists of a metal body which encloses a spring-loaded piston assembly. The valve is set to relieve at 350 psig internal system pressure.

*s. Liquid Quench Valve.* The liquid quench valve (fig. 1-4) is utilized to prevent excessive compressor inlet temperature during light-load operation when the refrigerant solenoid valve is closed and the hot gas bypass valve is open. The valve, in effect, is a small capacity expansion valve with its sensing bulb mounted to the compressor inlet line. The valve function is to de-superheat bypassed compressor discharge gas.



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Figure 1-2. Air conditioner, three quarter, right-rear view.

- |                                         |                                              |
|-----------------------------------------|----------------------------------------------|
| 1 U. S. Army identification plate       | 7 Condenser right-side access panel assembly |
| 2 Evaporator rear access panel assembly | 8 Condenser filter clean indicator           |
| 3 Liquid refrigerant sight indicator    | 9 Condenser inlet air filter                 |
| 4 Evaporator filter clean indicator     | 10 Condenser air inlet weather cover         |
| 5 Vent air inlet port                   | 11 Lifting eye (4)                           |
| 6 Fork lift channel (2)                 |                                              |

Figure 1-2—Continued.

*t. Heater Assembly.* The heater assembly (fig. 1-3) consists of six electrically operated CAL-ROD type heaters which provide a total heating capacity of 10.5 kw or 35,000 BTU/hour. The heater assembly is mounted in the evaporator outlet air stream so as to permit the evaporator fan to circulate ambient air over the heater assembly when the unit is in the heating cycle. The heater assembly operates on 416-volt, 400-cycle, 3-phase power and consumes approximately 10.5 kw. The operation of the heater assembly is controlled by the return air thermostat and the setting of the controls on the remote control box assembly.

*u. Mist Eliminator.* The mist eliminator (fig. 1-3) located between the evaporator assembly and the heater assembly, is constructed of eight double layers of high trutput herringbone mesh aluminum wire enclosed in a four by four mesh aluminum wire cloth screen. The frame and drain channels are constructed of aluminum alloy. The mist eliminator causes tiny water particles in the conditioned air stream (mist) to coalesce into water droplets sufficiently large to precipitate within the mist eliminator. The precipitated water is collected in the mist eliminator drain channels; and then flows into the air conditioner drain tube (fig. 1-3).

#### 1-4. Identification and Tabulated Data

*a. Identification.* The air conditioner has five major identification plates (fig. 1-8). The U.S. Army plate (A) on the rear of the air conditioner specifies the official nomenclature, including cooling capacity; Federal stock number; manufacturer, part number, serial number and date; inspection date; and contract number and unit weight. The compressor motor identification plate (B) located on top of the motor frame assembly specifies the manufacturer, part number, serial number, stock number and Stratos part number;

voltage, amperage, frequency and phase requirements; horsepower, and rotational speed expressed in revolutions per minute. The compressor identification plate (C) on the upper face of the compressor specifies the manufacturer, serial number and part number. The evaporator fan motor identification plate (D) on top of the motor frame specifies the manufacturer, model number, serial number and frame number; voltages, amperages, frequency and phase requirements; horsepower and duty ratings; and rotational speed expressed in revolutions per minute. The condenser fan assembly identification plate (E) located on the fan shroud specifies the manufacturer, model number, part number and serial number; voltages, amperages, frequency and phase requirements; horsepower and duty ratings, rotational speed expressed in revolutions per minute; and direction of fan rotation and direction of air flow.

##### *b. Tabulated Data.*

###### *(1) Air conditioner.*

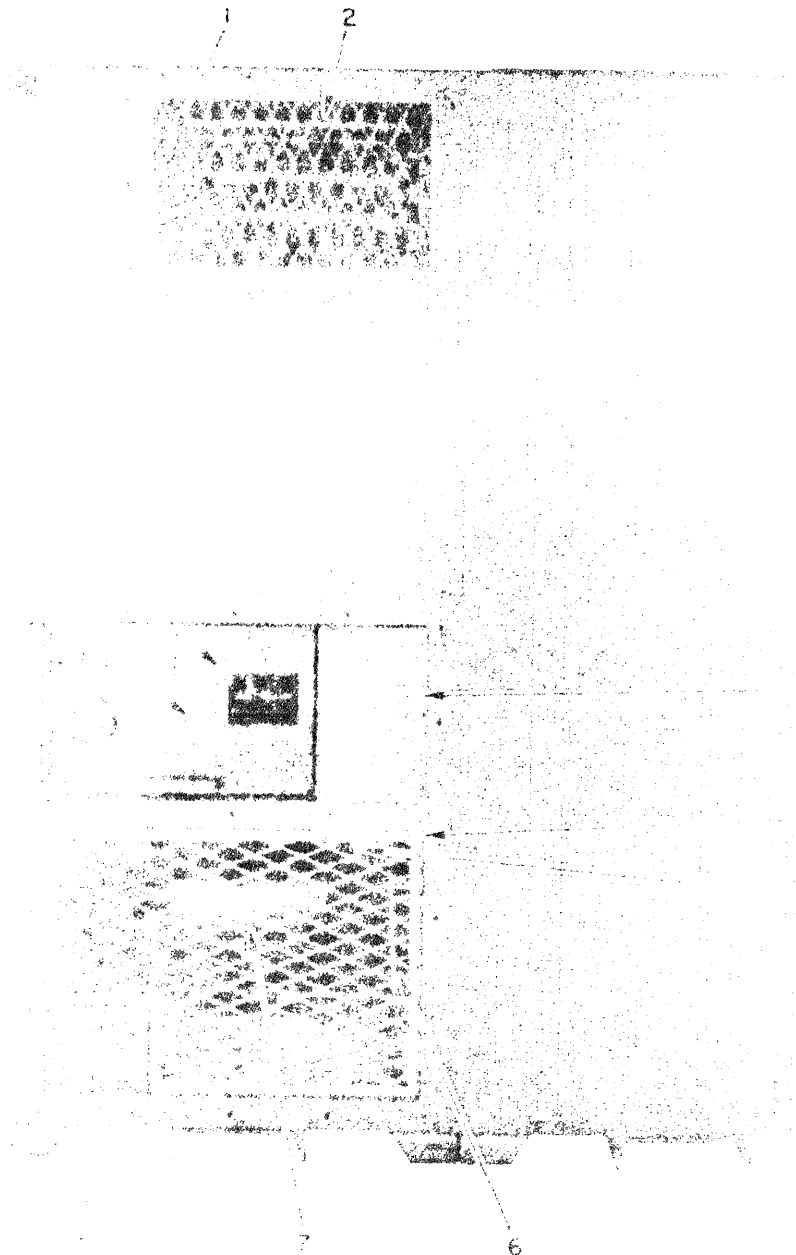
Manufacturer .....	Stratos Division, Fairchild Hiller Corp., Bay Shore, New York
Model .....	VEA4-3A
Refrigerant .....	Refrigerant-12 (Fed Spec BB-F-671a, Type R-12)
Capacity .....	38,000 BTU/hr

###### *(2) Compressor.*

Manufacturer .....	Stratos Division Fairchild Hiller Corp., Bay Shore New York
Model .....	FCR4-3
Part Number .....	26664-1
Type .....	Positive displacement, helical rotary

###### *(3) Compressor motor.*

Manufacturer .....	Westinghouse Electric Corp.
Part Number .....	923B238-2



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- |   |                                     |    |                                                      |
|---|-------------------------------------|----|------------------------------------------------------|
| 1 | Conditioned air outlet screen       | 9  | Electrical tray assembly                             |
| 2 | Heater bank assembly (2)            | 10 | Main power supply electrical connector               |
| 3 | Thermostat access panel             | 11 | Remote control harness assembly electrical connector |
| 4 | Recirculating air inlet screen      | 12 | System reset switch                                  |
| 5 | Thermostat temperature sensing bulb | 13 | Master circuit breaker                               |
| 6 | Evaporator assembly drain tube      | 14 | Mist eliminator                                      |
| 7 | Evaporator blower scroll            |    |                                                      |
| 8 | Vent air door control knob          |    |                                                      |

Figure 1-3. Air conditioner, front view with panel removed.

Stratos PN .....201782  
 Voltage .....416 vac  
 Amperage .....15 amps  
 Frequency .....400 cps  
 Phase .....3-phase  
 Horsepower .....8.4 hp  
 Rotational Speed .....7700 rpm

(4) *Evaporator fan motor.*

Manufacturer .....Aerospace Division,  
                                 WELCO Industries, Inc.  
                                 Cincinnati, Ohio  
 Part Number .....02-009947  
 Frame Number .....4720-19  
 Voltages .....208/416 vac  
 Amperages .....7.4/3.7 amps  
 Frequency .....400 cps  
 Phase .....3-phase  
 Horsepower .....1.66 hp  
 Rotational Speed .....3750 rpm  
 Duty Rating .....Continuous

(5) *Condenser fan assembly motor.*

Manufacturer .....General Dynamics  
                                 Electro Dynamic,  
                                 Avenel, New Jersey  
 Model .....K9130KC38  
 Part Number .....2660-811-X (GD-ED)  
 Voltages .....208/416 vac  
 Amperages .....11/5.5 amps  
 Frequency .....400 cps  
 Phase .....3-phase  
 Horsepower .....3.4 hp  
 Rotational Speed .....5800 rpm  
 Duty Rating .....Continuous

(6) *Refrigerant solenoid valve.*

Manufacturer .....ALCO Valve Co.,  
                                 St. Louis, Mo.  
 Type .....S804-FR, 1/2OD  
 Voltage .....24 vdc  
 Amperage .....1 amp  
 Power .....24 watts  
 Capacity .....18 pounds per minute of  
                                 refrigerant -12 at 265  
                                 psia and 150 F at  
                                 inlet, at 1 psia pressure  
                                 differential across the  
                                 valve.

(7) *Pressure relief valve.*

Manufacturer .....Henry Valve Co., Melrose  
                                 Park, Ill.  
 Part Number .....5221-350  
 Relief Pressure .....350  $\pm$  25 psig at 80  $\pm$  20F  
 Reset Pressure .....250  $\pm$  25 psig

(8) *Liquid quench valve.*

Manufacturer .....ALCO Valve Co.,  
                                 St. Louis, Mo.  
 Type .....TL-200 FL 27A  
 Power Assembly .....XB1033 FL 1A

Capacity .....2.8 tons with  
                                 refrigerant -12

(9) *Filter-drier.*

Manufacturer .....McIntyre Co., Subsidiary of  
                                 Superior Valve Co.,  
                                 Livingston, N. J.  
 Type .....M16-88  
 Flow Capacity .....34 pounds per minute  
                                 minimum refrigerant-12  
                                 flow at 2 psi pressure  
                                 drop.  
 Water Capacity .....250 drops at 75F and  
                                 200 drops at 125F at  
                                 15 ppm

(10) *Hot gas bypass valve.*

Manufacture .....ALCO Valve Co.,  
                                 St. Louis, Mo.  
 Type .....CPRH-35F  
 Capacity .....390 cubic feet per hour  
                                 refrigerant -12 discharge  
 Adjustment .....0 to 40 psig; set to crack  
                                 at 35 to 37 psig outlet  
                                 pressure

(11) *Drain-charge valve.*

Manufacturer .....Henry Valve Co.,  
                                 St. Louis, Mo.  
 Type .....6231, packless  
 Capacity .....265 psig 15 300F

(12) *High-low pressure cut-out switch.*

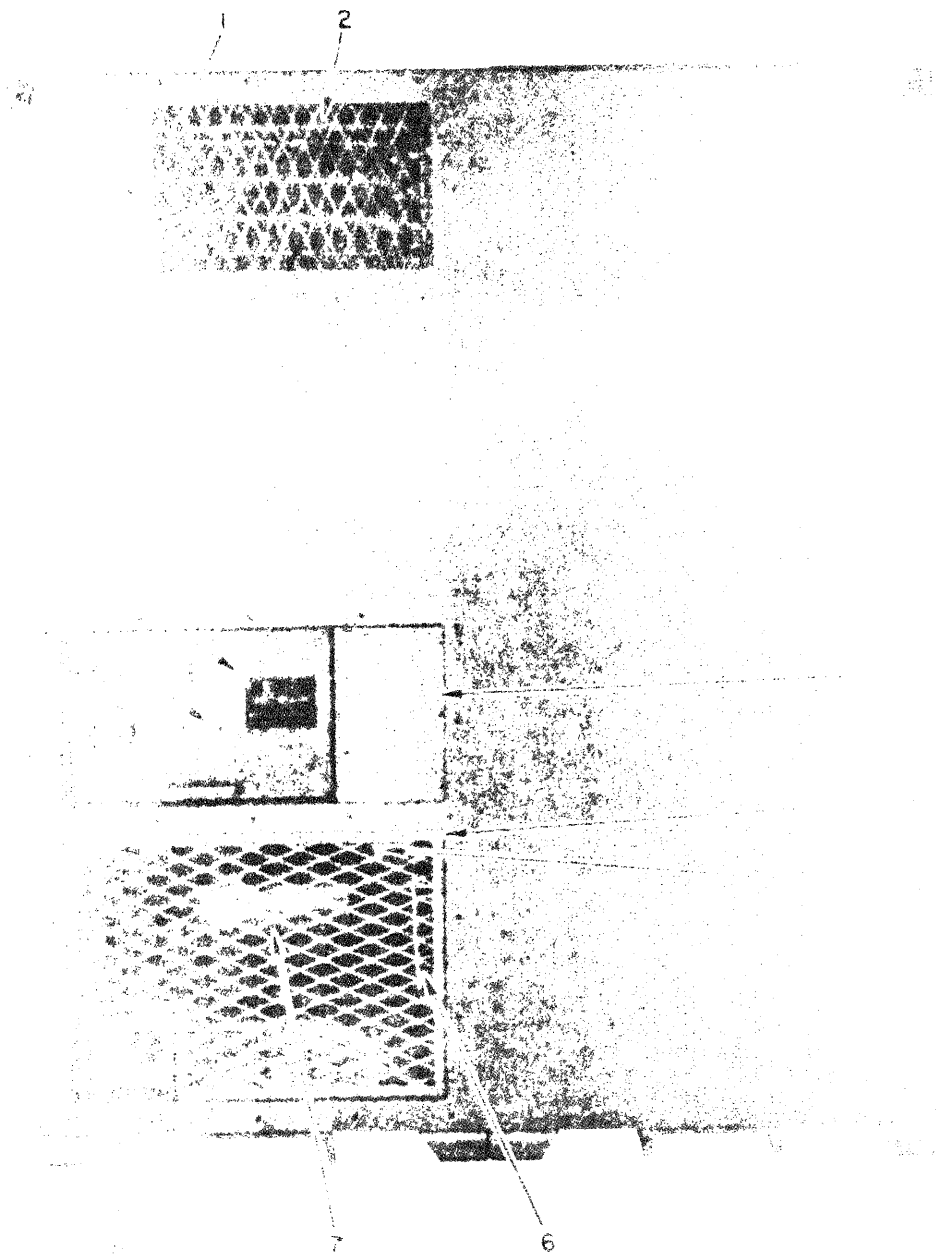
Manufacturer .....Penn Products Division,  
                                 Penn Controls, Inc.,  
                                 Goshen, Indiana  
 Type .....1277BP12  
 Style .....34  
 Voltage .....28 vdc  
 Amperage .....2 amps  
 Setting .....High Pressure: trip at  
                                 265  $\pm$  5 psig, reset at  
                                 210  $\pm$  10 psig.  
 Setting .....Low Pressure: trip at  
                                 20 (+1-0) psig, and reset  
                                 at 35  $\pm$  5 psig.

(13) *Thermoexpansion valve.*

Manufacturer .....ALCO Valve Co.,  
                                 St. Louis, Mo.  
 Type .....TCL-300 FW  
 Power Assembly .....XB1019 FW 1B  
 Capacity .....5.0 tons with  
                                 Refrigerant-12

(14) *Master circuit breaker.*

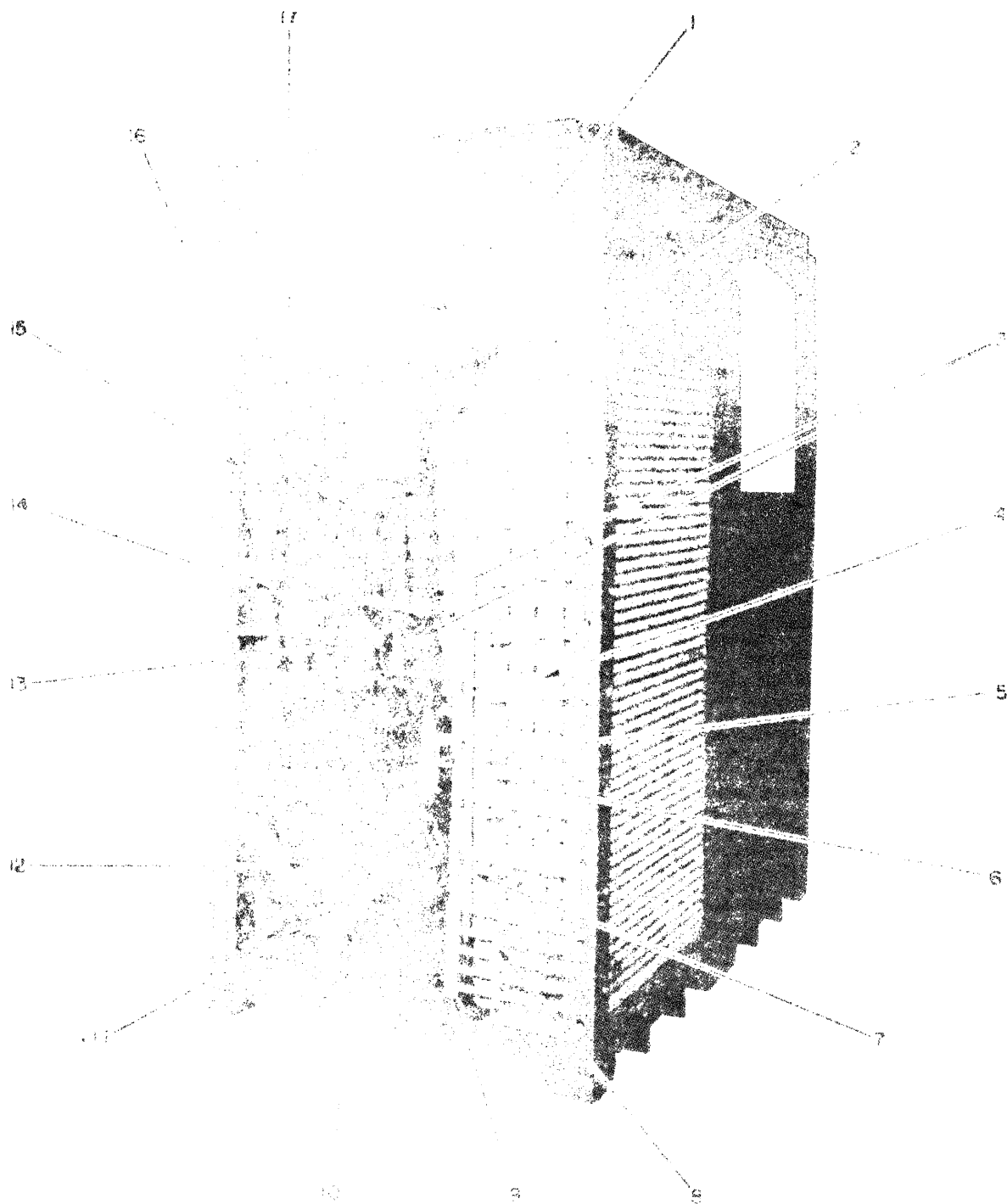
Manufacturer .....Heineman Electric Co.  
                                 Trenton, N. J.  
 Catalog Number .....CD3-3 pole  
 Current Rating .....26/52 Amp  
 Voltage .....416/208 vac  
 Frequency .....400 cps



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- |                                       |                                                         |
|---------------------------------------|---------------------------------------------------------|
| 1 Conditioned air outlet screen       | 9 Electrical tray assembly                              |
| 2 Heater bank assembly (2)            | 10 Main power supply electrical connector               |
| 3 Thermostat access panel             | 11 Remote control harness assembly electrical connector |
| 4 Recirculating air inlet screen      | 12 System reset switch                                  |
| 5 Thermostat temperature sensing bulb | 13 Master circuit breaker                               |
| 6 Evaporator assembly drain tube      | 14 Mist eliminator                                      |
| 7 Evaporator blower scroll            |                                                         |
| 8 Vent air door control knob          |                                                         |

Figure 1-3. Air conditioner, front view with panel removed.



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*Figure 1-4. Air conditioner, right-side view with panel removed.*

- |                                          |                                            |
|------------------------------------------|--------------------------------------------|
| 1 High-low pressure switch               | 10 Motor-compressor assembly               |
| 2 Hot gas bypass valve                   | 11 Charge valve                            |
| 3 Thru-bulkhead electrical connector (2) | 12 Motor-compressor assembly inlet fixture |
| 4 Condenser-subcooler assembly           | 13 Solenoid valve                          |
| 5 Motor-compressor assembly outlet tube  | 14 Liquid quench valve                     |
| 6 Condenser inlet manifold tube          | 15 Filter-drier                            |
| 7 Condenser outlet manifold tube         | 16 Pressure relief valve                   |
| 8 Subcooler inlet manifold tube          | 17 Terminal board (TB-1)                   |
| 9 Subcooler outlet manifold tube         |                                            |

Figure 1-4—Continued.

(15) *Power transformer (T1).*

Manufacturer ----- Microtran Co.,  
Valley Stream, N. Y.  
Model ----- M3328  
Primary Voltage ----- 208/416 vac  
Secondary Voltage ----- 30.2  $\pm$  1 vac (rms) for  
a 1.4 amp secondary load  
Frequency ----- 400 cps

(16) *Silicon rectifier (CR 1).*

Manufacturer ----- Sarkes Tarzian Inc.  
415 North College,  
Bloomington, Indiana  
Model ----- S-6184  
Current Ratings ----- 3.6 amps at 55C (131F)  
1.6 amps at 125C (257F)

(17) *Trip relay (K101).*

Manufacturer ----- Potter & Brumfield, Inc.  
Princeton, Indiana  
Model ----- MH17DM24V  
Voltage ----- 24 vdc  
Contact Rating ----- 5.0 amp at 115-volts,  
60-cycle resistive load  
Contact Arrangement ----- Four pole-double throw,  
double make.

(18) *Time delay relay (K102).*

Manufacturer ----- Dialtron Corp.,  
Brooklyn, N. Y.  
Model ----- FR-3S-ND-28  
Type ----- D8497-143-1  
Contact Rating ----- 2.0 amp, 28 vdc;  
resistive load.  
Contact Arrangement ----- Single pole-single throw,  
normally open.  
Nominal Delay Time ----- 3 sec  $\pm$  25 percent at 70F.

(19) *Thermo relay (K103).*

Manufacturer ----- Couch Ordnance, Inc., N.  
Quincy, Massachusetts  
Model ----- 2B36-B.  
Contact Rating ----- 5 amps, 28 vdc; minimum  
resistive load.

(20) *Compressor motor relay (K104).*

Manufacturer ----- Cutler-Hammer Controls,  
Division of Cutler-  
Hammer Int.,  
Milwaukee, Wis.

Catalog Number ----- 9565H94 (C-H)  
Military Standard ----- MS24193 D1 (ASG)  
Nominal Coil Voltage ----- 28 vdc  
Contact Arrangement ----- Three pole-single throw  
Contact Rating ----- 50 amps, 200 vac (400 cps)  
rated load per contact.  
Class ----- A5 (unsealed)

(21) *Condenser fan assembly motor re-  
lay (K105).*

Manufacturer ----- Cutler-Hammer Controls,  
Division of Cutler-  
Hammer Int.,  
Milwaukee, Wis.  
Catalog Number ----- 9565H2B (C-H)  
Military Standard ----- MS24192D1 (ASG)  
Nominal Coil Voltage ----- 28 vdc  
Contact Arrangement ----- Three pole-single throw  
Contact Rating ----- 25 amps, 200 vac (400 cps)  
rated load per contact.  
Class ----- A5 (unsealed)

(22) *Evaporator fan motor relay (K106).*

Manufacturer ----- Cutler-Hammer Controls,  
Division of Cutler  
Hammer Int.,  
Milwaukee, Wis.  
Catalog Number ----- 9565H2B (C-H)  
Military Standard ----- MS24192 D1 (ASG)  
Nominal Coil Voltage ----- 28 vdc  
Contact Arrangement ----- Three pole-single throw  
Contact Rating ----- 25 amps, 200 vac (400  
cps) rated load per  
contact  
Class ----- A5 (unsealed)

(23) *Heater control relay (K107).*

Manufacturer ----- Cutler-Hammer Controls,  
Division of Cutler-  
Hammer Int.,  
Milwaukee, Wis.  
Catalog Number ----- 9565H94 (C-H)  
Military Standard ----- MS24193D1 (ASG)  
Nominal Coil Voltage ----- 28 vdc  
Contact Arrangement ----- 50 amps, 200 vac  
(400 cps) rated load per  
contact  
Class ----- A5 (unsealed)





- |                                   |                                             |
|-----------------------------------|---------------------------------------------|
| 1 Condenser air discharge door    | 7 Quarter-turn fastener stud receptacle (4) |
| 2 Gasket                          | 8 Screw (8)                                 |
| 3 Piano hinge                     | 9 Nut (8)                                   |
| 4 Piano hinge pin                 | 10 Honeycomb assembly                       |
| 5 U. S. Army identification plate | 11 Condenser fan assembly motor             |
| 6 Lifting eye (4)                 | 12 Micro-switch (normally closed)           |

Figure 1-5. Air conditioner, top view with condenser discharge door open.

(24) Thermostat.

Manufacturer ----- Vap Air Division of  
Vapor Corp.,  
Chicago, Ill.

Catalog Number ----- 26420036  
Ambient Temp. Range ----- -65F to 200F  
Control Contact Setting -----  $100 \pm 3F$   
Maximum Current Rating ----- 100 ma at 30 vdc  
Wattage ----- 3 watts (any voltage)

(25) Phase sequence relay (K108).

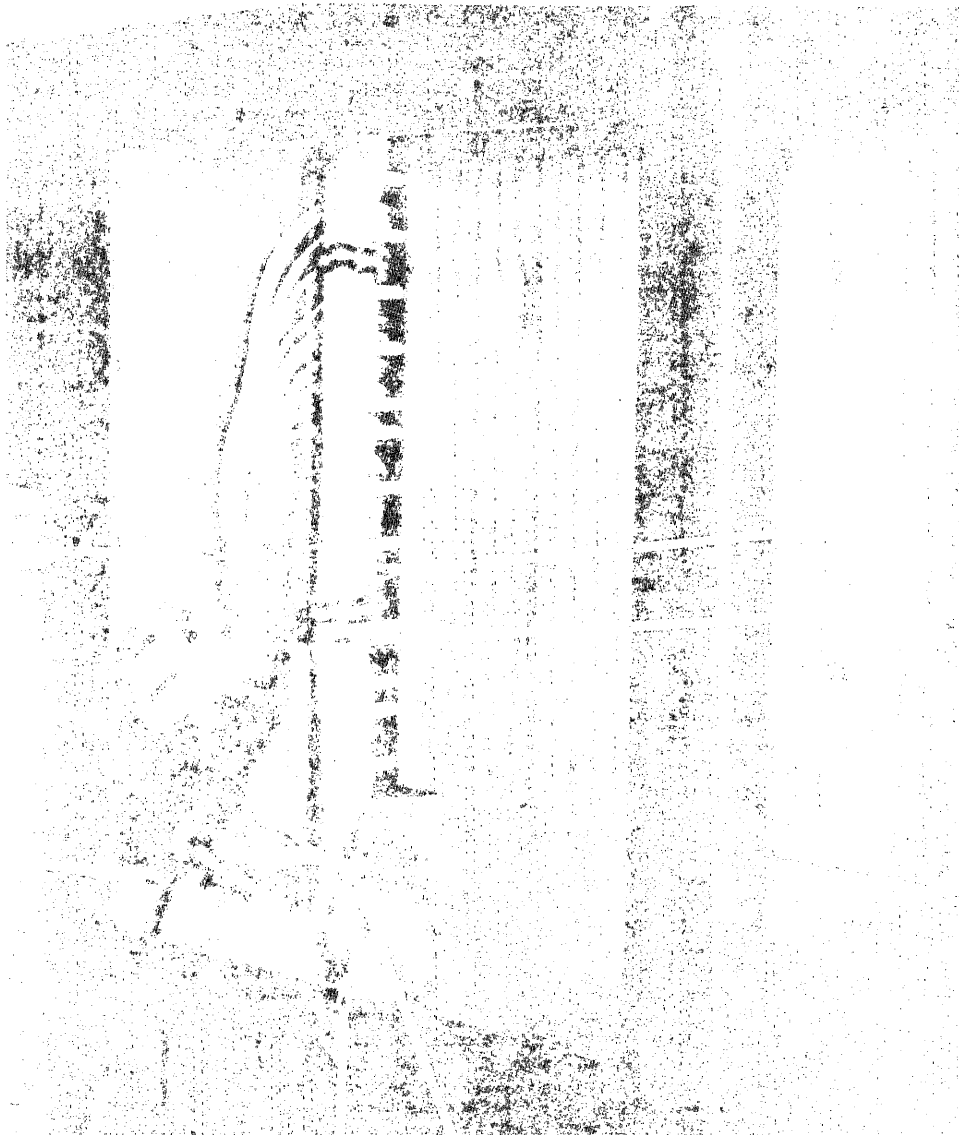
Manufacturer ----- Autron Mfg., Inc.  
Cleveland, Ohio

Model ----- AVR-869F—T6 or 4F  
Nominal Rating ----- 416 vac, 400 cps  
Pick-up sequence ----- L1, L2, and L3, L1 and L  
pick-up not possible as  
L1, L3 and L2.

(26) Capacities.

Refrigerant-12 ----- 10.0 pounds of  
refrigerant-12.  
Oil ----- 400 cc (16.9 fluid ounces)  
oil, Fed. Spec. VV-L-8  
RCO-3, Type III.

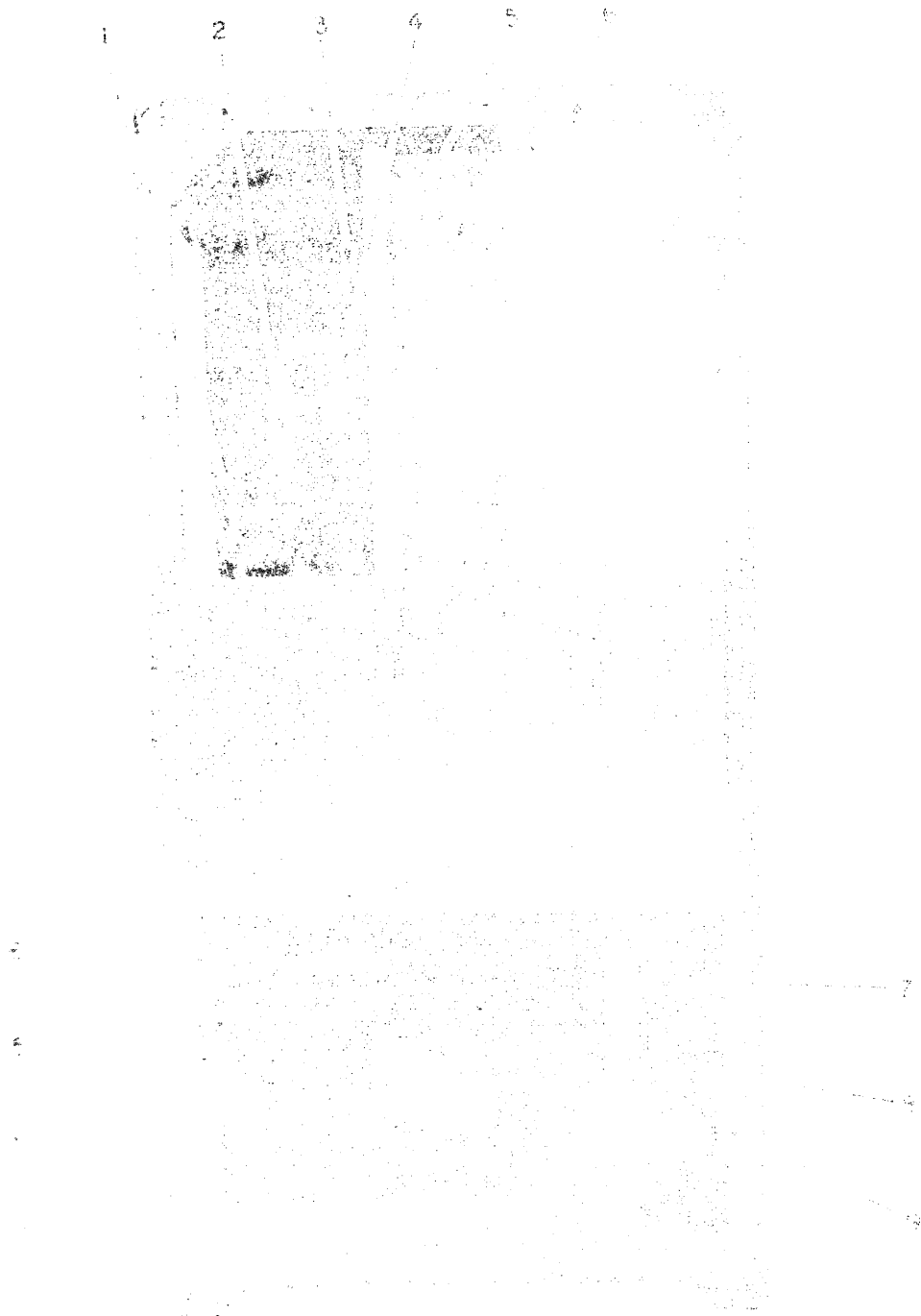
(27) Nut and bolt torque data. Refer  
table 1-1, torque requirements.



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- |                                                                       |                                            |
|-----------------------------------------------------------------------|--------------------------------------------|
| 1 Evaporator air inlet filter                                         | 7 Evaporator filter clean indicator        |
| 2 Filter hold down clamp (4)                                          | 8 Liquid refrigerant sight indicator       |
| 3 Evaporator outlet manifold tube                                     | 9 Condenser air inlet filter               |
| 4 Evaporator clean indicator pressure sensing tube                    | 10 Thermostatic expansion valve inlet tube |
| 5 Thermostatic expansion valve external equalizer tube                | 11 Thermostatic expansion valve bracket    |
| 6 Thermostatic expansion valve remote temperature sensing bulb tubing | 12 Thermostatic expansion valve            |
|                                                                       | 13 Evaporator inlet distributor            |

*Figure 1-6. Air conditioner, rear view with panels removed.*



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Figure 1-7. Air conditioner, left-side view with panels removed.

- |                                                              |                                                |                             |
|--------------------------------------------------------------|------------------------------------------------|-----------------------------|
| 1 Thermostatic expansion valve                               | 6 Evaporator assembly                          | 11 Connector link           |
| 2 Evaporator inlet distributor                               | 7 Recirculating air door link                  | 12 Vent air door link       |
| 3 Evaporator outlet manifold tube                            | 8 Recirculating air door                       | 13 Vent air door            |
| 4 Evaporator filter clean indicator<br>pressure sensing tube | 9 Vent air door control knob recessed<br>panel | 14 Evaporator blower scroll |
| 5 Evaporator air inlet filter                                | 10 Air circulation control link                | 15 Evaporator blower wheel  |
|                                                              |                                                | 16 Evaporator blower shroud |

Figure 1-7—Continued.

<b>U. S. ARMY</b>	
AIR CONDITIONED BASE MOUNTED SELF CONTAINED LIGHTWEIGHT AIR COOLED, 38,000 BTU/HR	
PART NO. <input style="width: 100px;" type="text"/>	FSN <input style="width: 100px;" type="text"/>
MFD BY <input style="width: 150px;" type="text"/>	
CONTRACT NO. <input style="width: 150px;" type="text"/>	
DATE <input style="width: 20px;" type="text"/> 19 <input style="width: 20px;" type="text"/>	INSPECTED <input style="width: 50px;" type="text"/> US
SERIAL NO <input style="width: 80px;" type="text"/>	WT <input style="width: 30px;" type="text"/> LB <input style="width: 30px;" type="text"/>

**A**

<b>STRATOS</b> DIVISION FAIRCHILD HILLER CORP		
MODEL NO. <input style="width: 60px;" type="text"/>	SERIAL NO. <input style="width: 60px;" type="text"/>	PART NO. <input style="width: 60px;" type="text"/>
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**C**

HP <input style="width: 30px;" type="text"/>	R.P.M. <input style="width: 40px;" type="text"/>	PH. <input style="width: 30px;" type="text"/>	CY. <input style="width: 30px;" type="text"/>
VOLTS <input style="width: 30px;" type="text"/>	AMP <input style="width: 30px;" type="text"/>	FRAME <input style="width: 40px;" type="text"/>	
<input type="radio"/> RTG <input style="width: 30px;" type="text"/>	RISE <input style="width: 30px;" type="text"/>	SER. NO. <input style="width: 40px;" type="text"/>	
THERMAL PROTECTED			
<b>WELCO INDUSTRIES INC.</b>			
AEROSPACE DIVISION		CINCINNATI, OHIO	

**D**

Motor, A.C.		
Mfr. Part No. <input style="width: 150px;" type="text"/>	Serial No. <input style="width: 150px;" type="text"/>	
Stock No. <input style="width: 150px;" type="text"/>	Order or Contract <input style="width: 150px;" type="text"/>	
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Hp <input style="width: 60px;" type="text"/>	Weight-Lbs <input style="width: 60px;" type="text"/>	R.P.M. <input style="width: 60px;" type="text"/>
Locked Rotary Current <input style="width: 150px;" type="text"/>		
Ultimate Trip Current <input style="width: 150px;" type="text"/>		
Internal Motor Protectors <input style="width: 150px;" type="text"/>		
Prop. of <input style="width: 60px;" type="text"/> Westinghouse Elec. Corp		
<input type="checkbox"/> 108P499H01	MADE IN U.S.A.	

**B**

<b>VANEAXIAL FAN</b>	
MOD NO. <input style="width: 80px;" type="text"/>	PN <input style="width: 80px;" type="text"/>
SER NO <input style="width: 80px;" type="text"/>	CUST PN <input style="width: 80px;" type="text"/>
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DUTY <input style="width: 60px;" type="text"/>	
RPM <input style="width: 60px;" type="text"/>	VOLTS <input style="width: 60px;" type="text"/>
CYCLE <input style="width: 60px;" type="text"/>	AMPS <input style="width: 60px;" type="text"/>
HP <input style="width: 60px;" type="text"/>	
PH <input style="width: 60px;" type="text"/>	
GENERAL DYNAMICS/ELECTRO DYNAMIC AVENEL, N. J.	
AIR FLOW <span style="font-size: 1.2em;">→</span>	

**E**

ME 4120-287-15/1-8

Figure 1-8. Identification plates.

Table 1-1. Torque Requirements

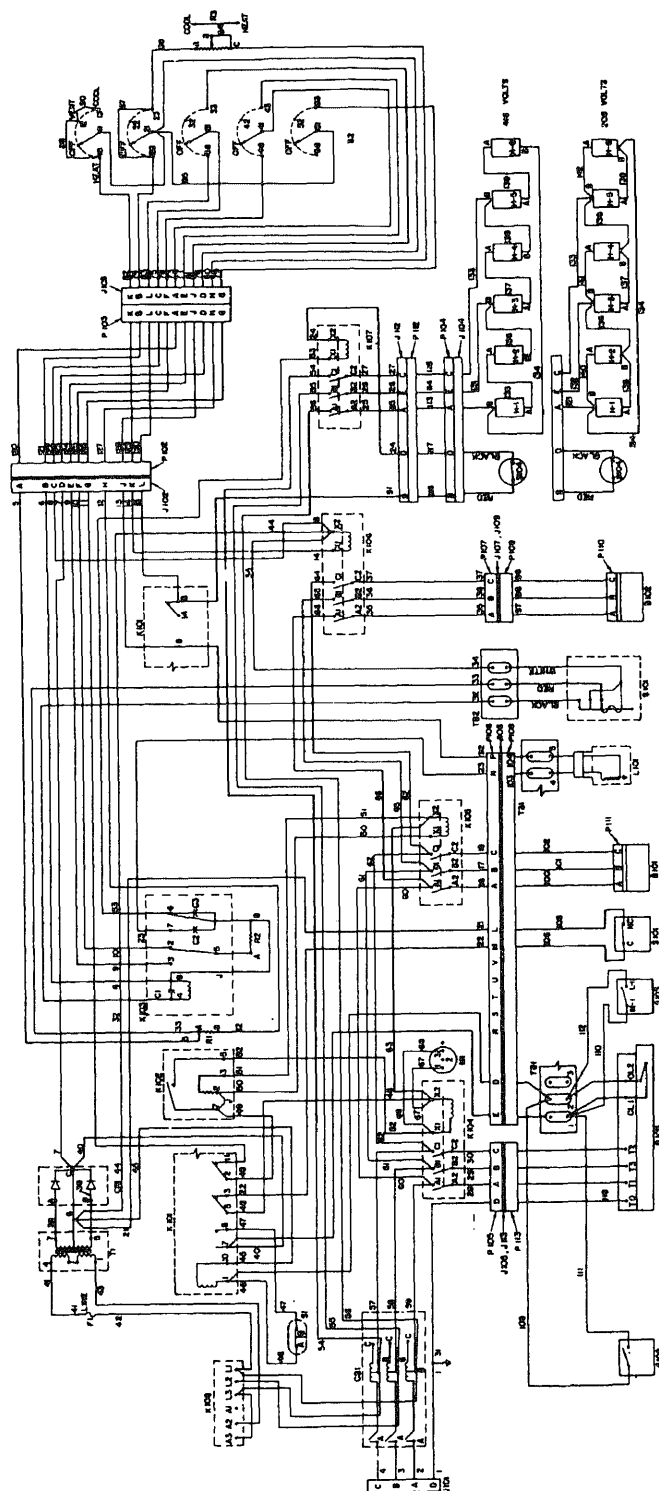
Tube size OD (inches)	Nut size	Aluminum tubing		Steel tubing	
		Minimum (ft-lb)	Maximum (ft-lb)	Minimum (ft-lb)	Maximum (ft-lb)
0.250	9/16 in.	40	60	135	150
0.375	11/16 in.	150	200	---	---
0.500	7/8 in.	250	350	---	---
0.625	1 in.	200	350	350	400
0.750	1-1/4 in.	300	500	350	400

(28) *Dimensions and Weight* (fig. 1-1).

Length	-----	40.0 inches
Width	-----	24.0 inches
Height	-----	49.0 inches
Weight	-----	375 pounds
Volume	-----	27.2 cubic feet

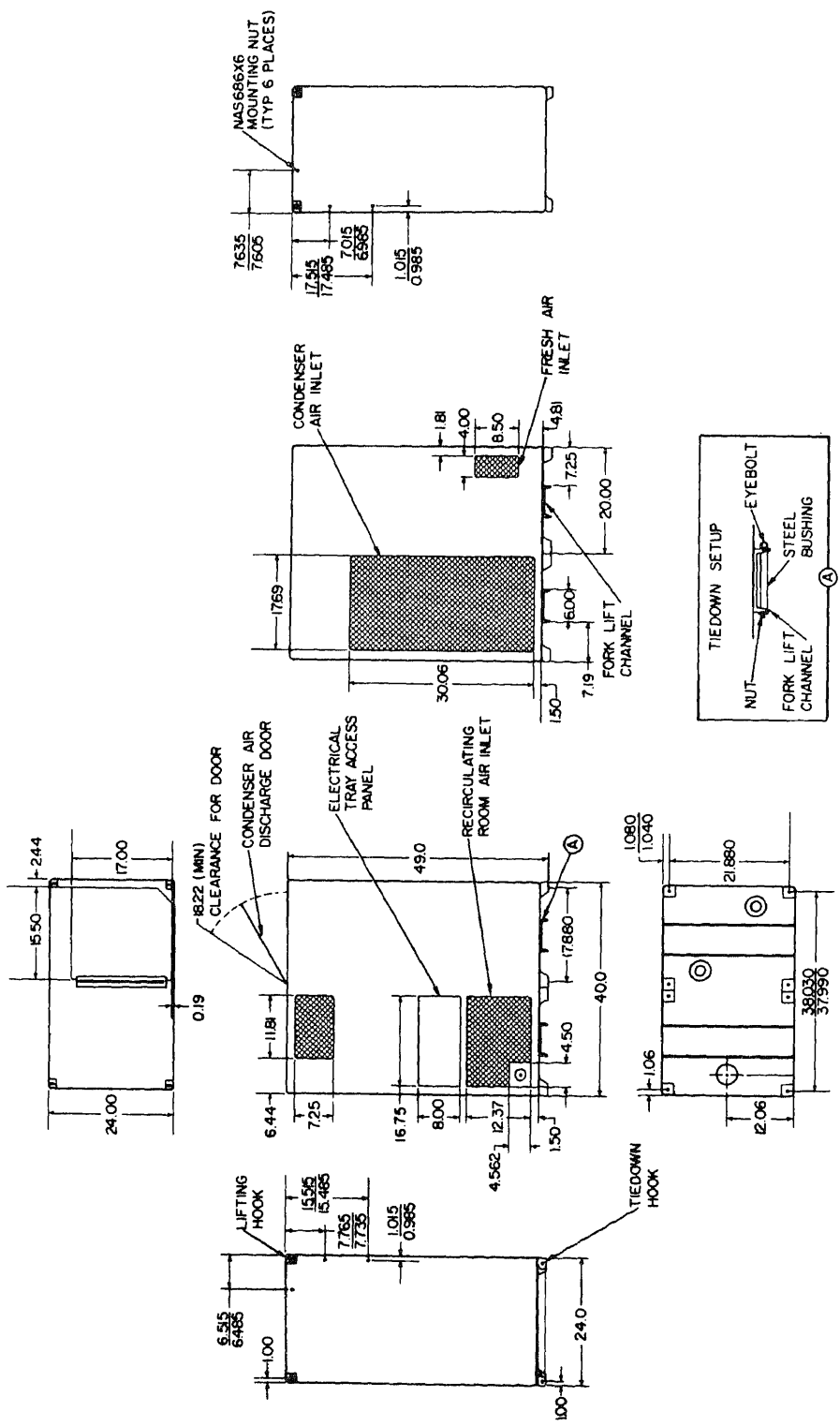
(29) *Wiring diagram*. A practical wiring diagram of the air conditioner electrical system is shown in figure 1-9.

(30) *Base plan*. Refer to figure 1-10 air conditioner installation.



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Figure 1-9. Air conditioner electrical system wiring diagram.



ME 4120-287-15/1-10

Figure 1-10. Installation and base plan.

### Section III. THEORY OF OPERATION

#### 1-5. General

This section describes the theory of operation of the refrigerant vapor cycle system.

#### 1-6. Theory (fig. 1-11)

a. During air conditioning operation, the condenser fan draws ambient air through the condenser and discharges it through the condenser fan discharge door. The evaporator fan draws air from the compartment to be air conditioned into the evaporator section where it is mixed with fresh air (if desired) and conditioned; then the air is passed back into the compartment through the evaporator conditioned air outlet port.

b. Low pressure, low temperature refrigerant vapor (refrigerant-12) enters the compressor through the compressor inlet leading from the evaporator outlet. The refrigerant vapor is compressed to a high pressure and temperature.

c. From the compressor, the refrigerant vapor enters the condenser, where it is condensed into a high-pressure liquid by giving up heat to the condenser airstream. The electrically driven condenser fan draws cooling air through the condenser and exhausts it to atmosphere. The liquid refrigerant then collects in the receiver, upstream of the condenser. The receiver stores surplus liquid refrigerant and compensates for inequalities in flow rates.

d. After leaving the receiver, the liquid refrigerant flows through the subcooler. Subcooling is necessary because of the line pressure drop in the line leading to the thermostatic expansion valve. The subcooler lowers the liquefied refrigerant temperature sufficiently (approximately 8F) to preclude flashback (vaporization) of the refrigerant on the way to the thermo-expansion valve.

e. From the subcooler, the liquid refrigerant passes through the filter-drier. The liquid refrigerant upon entering the filter-drier is directed through the drying agent and the filter screen.

f. From the filter-drier, the liquid refrigerant flows to the solenoid valve. The remote

thermostat, which senses compartment temperature, controls the operation of the solenoid valve. The valve closes to stop the flow of refrigerant to the expansion valve when compartment cooling is not required. When the solenoid valve is closed, pressure in the line from the evaporator to the compressor drops because the compressor is still operating. When this pressure drops to 35 to 37 psig, the hot gas bypass valve opens permitting compressor discharge vapor to flow into the compressor inlet line. When the temperature in the compressor inlet line becomes excessive due to hot bypassed vapor, the liquid quench valve opens to permit high-pressure liquid refrigerant to vaporize and flow into the line; thereby de-superheating the bypassed vapor and reducing the line temperature to a safe superheat level entering the compressor.

g. The liquid refrigerant passes from the solenoid valve through the refrigerant liquid sight indicator, and enters the inlet port of the thermostatic expansion valve where it is metered by the action of the valve pin. The valve pin is actuated by a diaphragm whose position is determined by the evaporator load and the superheat level sensed by the valve thermal bulb. To compensate for the effect of pressure drop across the evaporator, an external pressure equalizing line is connected between the evaporator outlet and the chamber below the valve diaphragm. Thus, the true evaporator outlet pressure is exerted beneath the valve diaphragm. The operating pressures on the valve diaphragm are now free from the effect of the pressure drop through the evaporator, and the expansion valve will respond to the superheat of the refrigerant vapor leaving the evaporator.

h. The thermostatic expansion valve is factory adjusted to maintain a nominal 5F superheat setting. The valve function is to maintain the nominal superheat setting in the evaporator, as dictated by the thermal sensing bulb. This is accomplished by modulating the flow rate of liquid refrigerant to the evaporator.

i. The actual cooling effect in this vapor cycle system occurs in the evaporator where the liquid refrigerant is evaporated under re-



duced pressure. In vaporizing, the refrigerant absorbs heat from the air being drawn through the evaporator by the evaporator fan, thereby reducing the temperature of the air which then flows to the compartment to be air con-

ditioned. The lowpressure, low-temperature refrigerant vapor then leaves the evaporator and flows through the compressor suction line through the compressor motor windings, to the compressor assembly and the cycle is repeated.

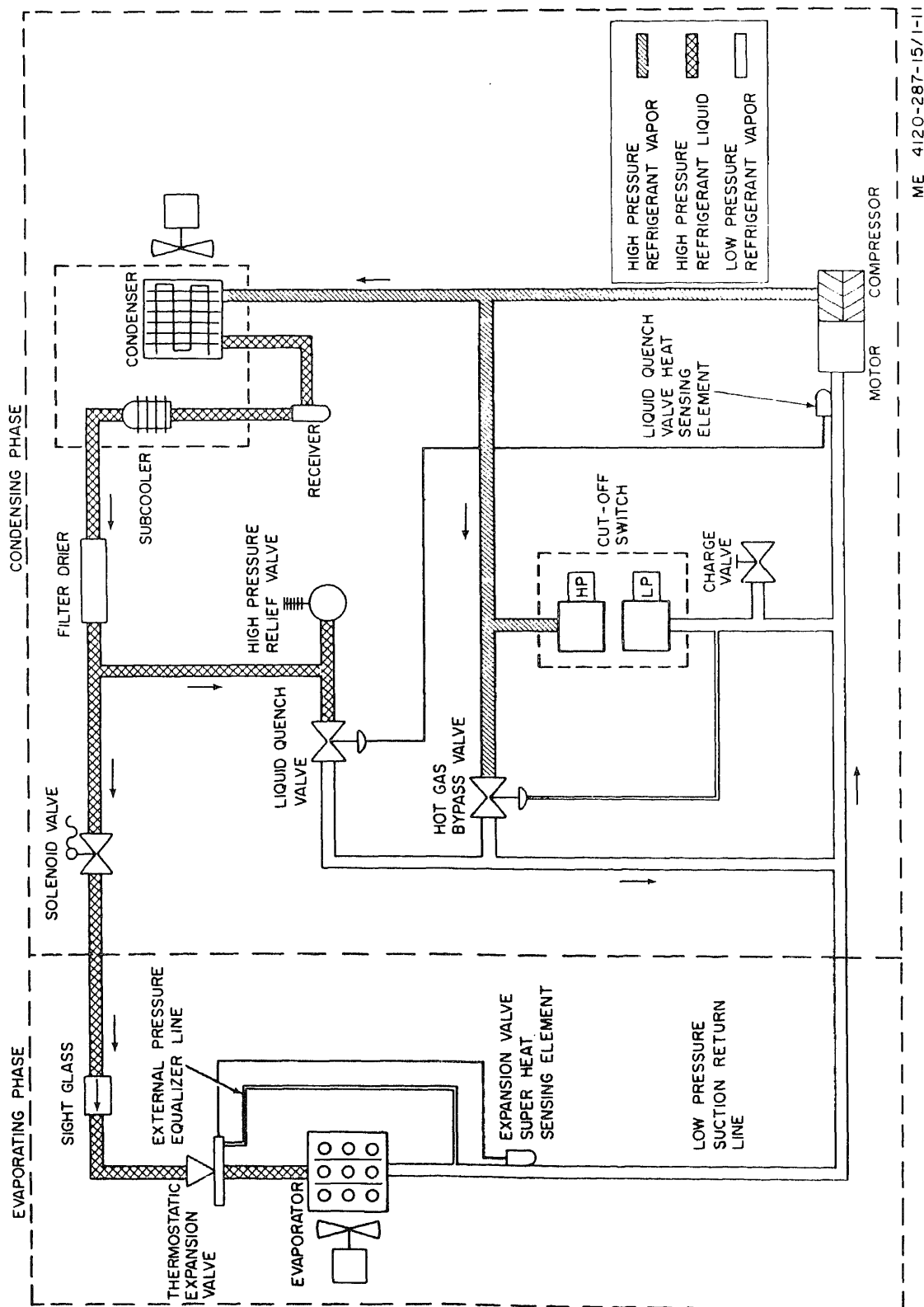


Figure 1-11. Refrigerant vapor cycle schematic diagram.

## CHAPTER 2

### INSTALLATION AND OPERATION INSTRUCTIONS

#### Section I. SERVICE UPON RECEIPT OF EQUIPMENT

##### 2-1. Unloading Equipment

a. The air conditioner is shipped in a single wood crate, packaged for shipment in conformance with Military Specification MIL-P116C, and Federal Specifications PPP-B-636 and PPP-B-601.

b. Lift the packaged air conditioner from the carrier using a hoisting device with a minimum rating of 750 pounds capacity.

**Caution:** When unloading the unit be careful to avoid damage to the air conditioner and separately packaged components. Make sure the air conditioner maintains an upright position during unloading.

##### 2-2. Unpacking Equipment

The air conditioner is securely fastened to supports and bolted to a wooden skid within the crate as shown in figure 2-1. Unpack equipment as follows:

a. Cut the metal straps, and uncrate the air conditioner.

b. Carefully remove the barrier paper and tape.

c. Remove the eight bolts securing the air conditioner to the wood skid. Using one of the following two methods, remove the air conditioner from the skid.

(1) Using the four lifting eyes in the top corners of the cabinet (fig. 1-10) lift the air conditioner with a sling. Use spreader bars to maintain a 90-degree angle between the sling and cabinet top panel while lifting air conditioner off skid.

**Caution:** Guy ropes must be used to prevent excessive swinging that might dam-

age the air conditioner when a hoisting device is used.

(2) Using a fork lift with suitable fork prong dimensions, insert fork lift prongs into fork lift channels formed by the base of the air conditioner (fig. 1-10). Elevate slightly and check stability of unit; then lift air conditioner off skid.

d. Open the separate shipping carton and unpack the remote control box and wiring harness assemblies.

*Note.* Tiedown points, located at each of the four ends of the fork lift channels, facilitate moving the air conditioner after its been uncrated. When using the tiedown points place a pipe bushing at the four points between the holes in the ends of the fork lift channels (fig. 1-10); then attach an eyebolt and clevis through the bushings to provide for attaching the tiedown straps to the air conditioner.

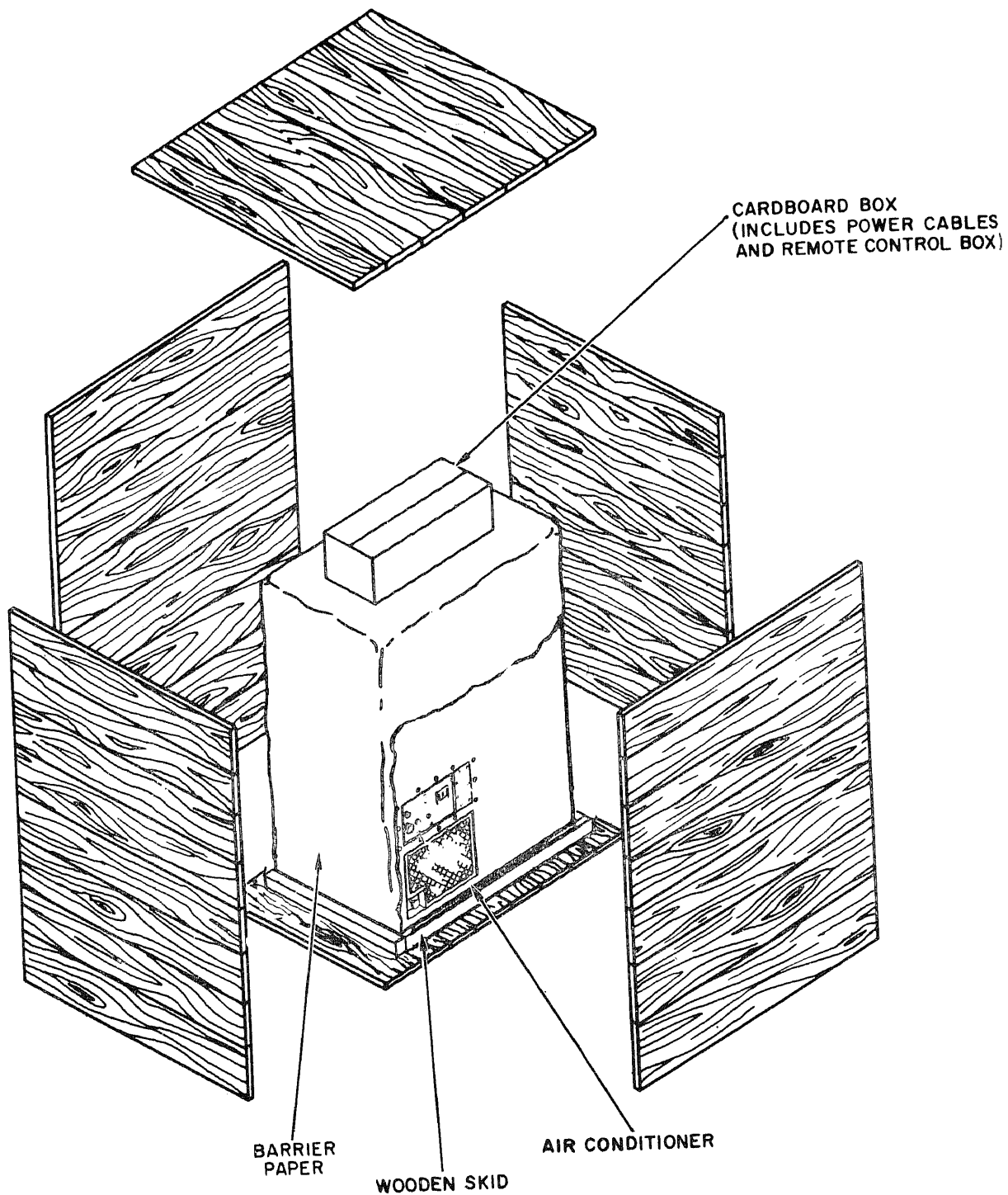
##### 2-3. Inspecting and Servicing Equipment

a. A complete inspection of the air conditioner should be made upon receipt of unit. Inspect the air conditioner as follows:

(1) Remove the housing panels (para 3-23 thru 3-29), and open the condenser discharge door (para 3-30).

(2) Inspect the housing panels and condenser discharge door for dents, breaks, missing or defective fasteners, loose welds or rivets, defective gaskets, and damaged insulation (para 3-21 thru 3-30).

(3) Visually inspect the entire unit for cracks, breaks, loose or missing hardware, loose connections, and broken or damaged wire leads. Inspect for any tampering or damage that may have occurred in transit.



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*Figure 2-1. Air conditioner shipping package.*

(4) Examine the evaporator and condenser assembly air inlet filters for dirt, dust or other obstructions (para 3-10 and 3-11).

(5) Inspect the remote control box assembly air conditioning switch and temperature control rheostat for proper operation.

(6) Examine the remote control wiring harness for possible defects (para 3-38).

(7) Check the master circuit breaker for proper operation. Set master circuit breaker to OFF position.

(8) Make sure that a good fuse is in the electrical tray fuse holder (para 3-37).

(9) Inspect the air conditioner thermostat for physical damage and security of mechanical and electrical connections (para 3-39).

(10) Check all air conditioner components for security of attachment.

(11) Visually inspect the compressor area for indications of oil or refrigerant leaks.

(12) Correct all deficiencies or report them to direct support maintenance.

(13) Install all air conditioner housing panels and close the condenser discharge door (para 3-23 thru 3-30).

b. When using the air conditioner perform daily preventive maintenance services in accordance with paragraph 3-6.

## 2-4. Installation Instructions

a. Due to conditions which may vary at the worksite detailed installation instructions are not provided with this manual. Steps described in this paragraph are minimum installation requirements necessary for efficient operation of the air conditioner. Adaptations should be made to conform with ductwork existing at the installation site. See figure 1-10 for installation and base plan space requirements.

(1) Using the lifting method described in paragraph 2-2c (1) or (2), position the air conditioner in the appropriate location on the shelter (or trailer) so that the conditioned air outlet and recirculating air inlet ports line up with the provided ducting at the installation site.

(2) Make sure that unobstructed outdoor ambient air flow is available at the condenser

air inlet, condenser air discharge, and vent & inlet ports.

(3) Secure the air conditioner to mounting base using the eight mounting holes provided in the base of the air conditioner (fig. 1-10). When necessary, use shims to level air conditioner.

*Note.* An air tight seal must be maintained between external ducting and the air conditioner for efficient operation. Make certain that the ducting and air conditioner are properly aligned after leveling air conditioner.

(4) Mount the remote control box assembly on a wall or panel at a convenient level for operation.

*Note.* Remove electrical tray assembly panel (para 3-25) and store for future use.

(5) Connect remote control wiring harness plug P103 to remote control box assembly receptacle J103 (figs. 1-3 and 2-2). Connect remote control wiring harness plug P102 to electrical tray remote control receptacle J102 (figs. 1-3 and 2-3).

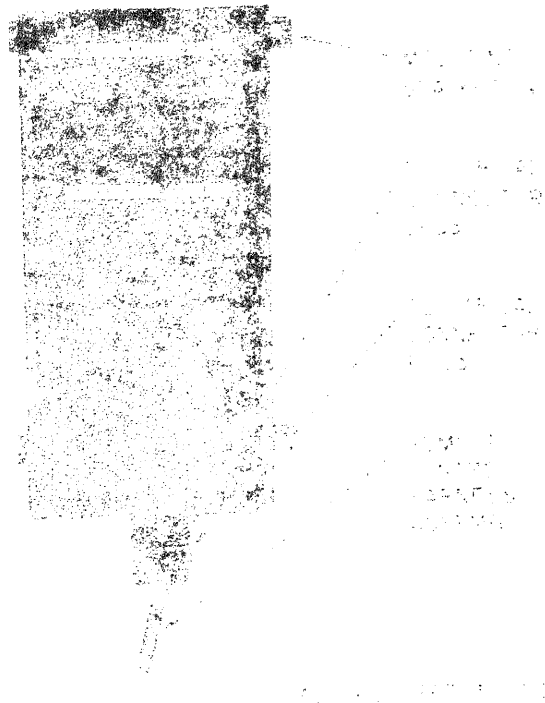


Figure 2-2. Remote control box assembly.

Figure 2-3. Electrical tray assembly control panel.

**Warning:** Make sure MASTER CIRCUIT BREAKER is set to OFF position before connecting P102 to J102.

(6) Connect input power plug P101 to a 416-volt, 3-phase, 400-cycle, 4-wire power source. Make sure ground wire of 4-wire source is connected to plug P101 terminal D. Connect wire carrying phases 1, 2, and 3 to plug P102 terminals A, B, and C, respectively.

**Warning:** Make sure main power supply is disconnected before attempting to wire P101. Make sure master circuit breaker is set to OFF position before connecting P101 to J101.

(7) Connect input power plug P101 to electrical tray input power receptacle J101 (fig. 2-3).

**Caution:** The air conditioner is wired to operate from a 416-volt, 3-phase, 400-cycle 4-wire power source. Make sure power source supply is correct before attempting start up.

(8) Check phase relationship by starting air conditioner in accordance with paragraph 2-10. If the air conditioner does not start operating (as evidenced by no airflow from conditioned air outlet duct) perform the following:

(a) Set master circuit breaker to OFF position, and disconnect main power supply.

(b) Disconnect plug P101 from input power receptacle J101 and main power supply.

(c) Switch any two "hot" leads at input power plug P101.

(d) Reconnect main power supply. Make sure master circuit breaker is set to OFF position; then connect plug P101 to electrical tray input power receptacle J101.

(e) Restart air conditioner; if the air conditioner still does not operate refer to paragraph 3-12.

(9) In the event that pre-filtered, de-contaminated fresh air is required for air conditioning, the shelter's fresh air supply must first be passed through a special filtering and de-contaminating unit which is an integral part of the shelter's equipment (mounted under the air conditioning unit and connected with a flexible duct to the air conditioner fil-

tered air inlet (fig. 1-10). This prefiltered supply is then discharged to the filtered fresh air intake, located beneath the evaporator fan. The fresh air door control handle must be turned counter-clockwise to the closed position when de-contaminated fresh air is required.

b. When installing Model VEA4-3A air conditioning unit indoors perform all steps specified in paragraph 2-4a. Additional ductwork must be provided as follows:

(1) Provide suitable ductwork to carry condenser discharge air away from area being cooled.

(2) Provide suitable ductwork to supply fresh air to the condenser inlet and fresh air inlet (fig. 1-10).

## Section II. MOVEMENT TO NEW WORKSITE

### 2-5. Dismantling for Movement

a. *Short Distance.* When moving the air conditioner to a new worksite which is a short distance away, perform the following:

(1) Set air conditioning switch, located on remote control box assembly, to OFF position. Set the master circuit breaker switch to OFF position.

(2) Turn off main power supply. Disconnect power plug (P101) from input power receptacle (J101) at electrical tray front panel.

(3) Disconnect remote control wiring harness plug (P102) from electrical tray remote control receptacle (J102) and from base of remote control box.

(4) Remove the remote control box assembly from its mounting.

(5) Close and secure the condenser air discharge door. Replace panel over electrical tray front panel. Make sure all panels are secure.

(6) Release the eight mounting bolts securing air conditioner to mount.

(7) Using the lifting method described in paragraph 2-2c (1) or (2), place the air conditioner on rolls or a skid.

b. *Long Distance.* When moving the air conditioner to a new worksite which is a long distance away, perform steps 2-5a (1) through (4); then perform the following:

(1) Place a shipping plug on the high-pressure relief valve outlet port.

(2) Close and secure the condenser air inlet door. Replace panel over electrical tray front panel. Make sure all panels are secure.

(3) Release the eight mounting bolts securing air conditioner to mount.

(4) Inspect the air conditioner to determine its condition. Correct deficiencies before placing equipment in limited storage. Perform technical inspections on unboxed items in accordance with AR 743-505.

(5) Using a cloth dampened with an approved solvent clean the air conditioner. Dry thoroughly.

(6) Paint all surfaces as needed. Refer to TM 9-213.

(7) Coat machined surfaces with preservative, or cover with barrier material. Coat exposed metal surfaces with preservative.

(8) Using pressure tape, seal all openings.

(9) Wrap air conditioner in two layers of barrier paper, and pack it in a wooden crate. Provide a separate container for remote control box and wiring harness; pack items firmly in cellulose wadding or other protective material.

(10) Securely nail wooden crate closed, and wrap with steel handling strips.

(11) Using the lifting method described in paragraph 2-2c (1) or (2), place air conditioner on bed of carrier.

(12) Securely block or tie the crated air conditioner on the carrier. If the carrier has a wooden floor, spike the crated air conditioner to the carrier bed.

(13) Store air conditioner in a room maintained at an even temperature and relatively low humidity. Cover entire air conditioner

with a tarpaulin when no suitable storage facility is available.

## 2-6. Reinstallation after Movement

*a. Short Distance.* Reinstall air conditioner according to paragraph 2-4, after moving air conditioner a short distance (para 2-5a).

*b. Long Distance.* Reinstall air conditioner according to paragraphs 2-3 and 2-4, after moving air conditioner a long distance (para 2-5b).

## Section III. CONTROLS AND INSTRUMENTS

### 2-7. General

This section describes, locates, illustrates, and furnishes operator, crew, or organizational maintenance personnel sufficient information about various controls and instruments for proper operation of the air conditioner.

### 2-8. Controls and Instruments

*a. Remote Control Box.* The air conditioning switch and the continuously variable temperature control resistor (fig. 2-2) are flush mounted on the front of the remote control box assembly. The switches function as follows:

(1) *Air conditioning switch.* The four-position heat-off-vent-cool, five-deck air conditioning switch controls the air conditioner mode of operation. When in the HEAT position the evaporator fan is placed in operation and the heater circuit is closed and controlled by the temperature control variable resistor. When in the OFF position all relays are deenergized, and the air conditioner does not condition the shelter air. When in the VENT position the air conditioner recirculates the shelter air with the evaporator fan; fresh air may be drawn into the shelter by turning the fresh air control handle, located in lower left hand front section of air conditioner, to OPEN position. When in the COOL position the motor-compressor circuit is closed, the evaporator and condenser fans are energized, and the cooling system starts to function—cooling the shelter air.

(2) *Temperature control.* The continuously variable temperature control resistor controls the air conditioner return air temperature. The temperature range on the cooling cycle is from 60° F to 90° F. The temperature range on the heating cycle is from 60° F to 90° F.

*b. Electrical Tray Panel.* The system reset switch, elapsed time meter, 28V DC supply 3/4 amp fuse indicator light and fuse holder, and the master circuit breaker (fig. 2-3) are flush mounted on the front panel of the electrical tray assembly. The control and instrument functions as follows:

(1) *System reset switch.* This push button-type switch must be reset (depressed) in the event that the low ambient temperature switch, or the compressor motor thermal overload contacts in the refrigerant circuit are tripped.

(2) *Elapsed time meter.* Culminative air conditioner operating time is registered on the elapsed time meter. Total operating time is read by locating the black bubble in the meter's mercury column and noting the bubble height on the graduated scale along side of the mercury column. The scale meter range is from 0 to 10,000 hours, each scale division being equivalent to 100 hours operating time.

(3) *Master circuit breaker.* This circuit breaker controls the power supplied to the air conditioner through the power input receptacle P101. This switch has ON (up) and OFF (down) positions.



(4) *28V DC Supply 3/4 amp fuse indicator and fuse holder.* This indicator lamp lights when the 28-volt dc supply line overloads and blows the 28-volt dc fuse.

*c. Monitoring Instruments.* The liquid refrigerant sight indicator and moisture indicator, and the evaporator and condenser section filter clean indicators, continuously monitor the air conditioner air circulation system and vapor cycle system. The daily and quarterly preventive maintenance services (para 3-6 and 3-7) must be performed as indicated by the monitoring instrument readings for the air conditioner to operate at its rated capacities.

(1) *Refrigerant liquid line sight glass and moisture indicator.* The refrigerant liquid sight indicator (fig. 2-4) flush mounted beneath the evaporator rear access panel, allows visual observation of the refrigerant-12 flow. Bubbles, or a milky appearance in the sight glass indicate a shortage of refrigerant or a restricted liquid line. The moisture indicator, located within the refrigerant liquid sight indicator, indicates moisture level in the vapor cycle system by changing color from green to yellow. Notify field maintenance should the moisture indicator turn yellow, or bubbles appear in the sight glass.

(2) *Evaporator filter clean indicator.* The evaporator filter clean indicator (fig. 2-4) flush mounted beneath the evaporator rear access panel, monitors the velocity of air passing through the evaporator filter screen. When the indicating ball rises to the upper arrows (fig. 2-4) service the evaporator inlet filter (para 3-11).

(3) *Condenser filter clean indicator.* The condenser filter clean indicator (fig. 2-5.) flush mounted on the air conditioner rightside panel, monitors the velocity of air passing through the condenser filter screen. When the indicating ball rises to the upper arrows (fig. 2-5.) service the condenser air inlet filter (para 3-10).



Figure 2-4. Refrigerant liquid sight indicator and evaporator filter clean indicator.



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Figure 2-5. Condenser filter clean indicator.

## Section IV. OPERATION OF EQUIPMENT

## 2-9. General

a. Instructions in this section are published for information and guidance of personnel responsible for operation of the air conditioner.

b. The operator must know how to perform every operation of which the air conditioner is capable. This section gives instructions on starting and stopping the air conditioner, and in setting the air conditioner mode of operation.

## 2-10. Starting

a. *Preparation for Starting.*

(1) Perform necessary daily preventive maintenance services (para 3-6).

(2) Check air conditioning requirements to determine necessary mode of operation.

b. *Starting.* When starting the air conditioner perform the following:

(1) Set the air conditioning switch and master circuit breaker switch to their OFF position (fig. 2-2 and 2-3).

(2) Turn the fresh air control knob (fig. 1-3) to the OPEN or CLOSE position, depending on shelter air conditioning requirements as determined in step a (2) of this paragraph.

(3) Set the air conditioning switch to either the HEAT, VENT, or COOL mode of operation as determined in step a (2) of this paragraph.

(4) Open condenser air discharge door when air conditioning switch is set for COOL mode of operation.

(5) Place the master circuit breaker in the ON (up) position (fig. 2-3).

(6) Set the temperature control variable resistor as necessary to achieve the desired shelter air temperature range.

*Note.* The temperature control variable resistor setting has no effect when the air conditioning switch is set in the VENT position.

## 2-11. Stopping

a. *Stopping Procedure.* When stopping the air conditioner perform the following steps:

(1) Set the air conditioning switch to the OFF position.

(2) Set the master circuit breaker switch to the OFF (down) position.

b. Perform the necessary daily preventive maintenance services (para 3-6).

## 2-12. Operating under Unusual Conditions

a. When starting the air conditioner under unusual conditions perform the following steps:

(1) Perform necessary daily preventive maintenance services (para 3-6).

(2) Check air conditioning requirements to determine necessary mode of operation.

(3) Set the air conditioning switch to the OFF position.

(4) Turn the fresh air control knob (fig. 1-3) to the OPEN or CLOSE position, depending on air conditioning requirements determined in step (2) above.

(5) Make sure the condenser air outlet door (fig. 1-5) is open.

(6) Connect the remote control wiring harness plug (P102) to the remote control receptacle (J102) located on the electrical tray front panel.

(7) Connect the main power cable to the input power plug P101 in accordance with paragraph 2-4a(6). Connect plug P101 to power input receptacle J101.

(8) Set the air conditioner switch and temperature control switch in accordance with paragraph 2-10 b (3) and (6).

(9) Place the master circuit breaker in the ON (up) position (fig. 2-3) to start air conditioner.

b. When stopping the air conditioner perform the following:

(1) Set the air conditioning switch in the OFF position.

(2) Place the master circuit breaker in the OFF (down) position.

(3) Perform the necessary daily preventive maintenance services (para 3-6).

**2-13. Operation in Dusty or Sandy Areas**

**Caution:** When operating the air conditioner in sandy or dusty areas, install a screen or porous cloth over the condenser air inlet metal grill (fig. 1-1) and the inlet opening of the fresh air door (fig. 1-1). Clean the evaporator and condenser assemblies and filters frequently (para 3-10 and 3-11). Provide a structure to protect the air conditioner from abrasion damage; arrange for adequate ventilation; paint all surfaces that have chipped or peeled.

**2-14. Operation Under Rainy or Humid Conditions**

**Caution:** When operating the air conditioner under rainy or humid conditions or in direct sunshine, provide a structure to protect the air conditioner from rain and moisture or direct sunshine. Provide adequate ventilation; keep electrical components dry and clean; paint all surfaces that have chipped or peeled.

## Section V. OPERATION OF AUXILIARY MATERIAL USED IN CONJUNCTION WITH THE AIR CONDITIONER

**2-15. Fire Extinguisher (Monobromotrifluoromethane Type)**

*a. Description.* The monobromotrifluoromethane type fire extinguisher is generally suitable for all types of fire, except fires involved with LOX (liquid oxygen) generating equipment. The fire extinguisher is furnished with a disposable type cylinder.

*b. Operation.* To operate the fire extinguisher perform the following:

- (1) Remove fire extinguisher from its location.
- (2) Break seal by pulling safety pin from handle.
- (3) Point horn at base of flame.
- (4) Press trigger for discharge and direct stream at base of flame.
- (5) Replace cylinder immediately after using.

*c. Replacement of Cylinder.* To replace cylinder, perform the following:

- (1) Press lever to release pressure from used cylinder.

- (2) Loosen swivel valve coupling nut and remove valve assembly from cylinder.

- (3) Remove instruction band from used cylinder.

- (4) Place new cylinder through instruction band.

- (5) Replace safety pin in valve and seal pin with sealing wire.

- (6) Attach valve assembly and tighten swivel coupling nut on the new cylinder and place fire extinguisher in mounting bracket.

- (7) Adjust instruction band on cylinder to show maintenance and operating instructions.

*d. Maintenance.* Weigh fire extinguisher every 3 months and replace cylinder if gross weight has decreased 4 ounces or more. Lubricate cylinder neck threads with one drop of OE 30 oil before reassembly.



# CHAPTER 3

## OPERATOR AND ORGANIZATIONAL MAINTENANCE

### INSTRUCTIONS

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#### Section I. OPERATOR AND ORGANIZATIONAL MAINTENANCE

##### TOOLS AND EQUIPMENT

###### 3-1. Special Tools and Equipment

No special tools or equipment is required by operator or organizational maintenance personnel for maintenance of the air conditioner.

###### 3-2. Basic Issue Tools and Equipment

Tools and repair parts issued with or authorized for use with the air conditioner are listed in the basic items list, appendix B of this manual.

#### Section II. LUBRICATION

###### 3-3. General Lubrication Information

a. During normal operation and maintenance procedures the air conditioner requires no lubrication.

b. Lubricant is added to the refrigerant system only when recharging the air conditioner with refrigerant. Refer to support and depot maintenance.

###### 3-4. Detailed Lubrication Information

a. *General.* Keep lubricant in closed container and store in a clean, dry place away from external heat. Allow no dust, dirt, or other foreign material to mix with the lubricant. Keep all lubrication equipment clean and ready to use.

b. *Lubrication.* Lubricant is added to the refrigerant system in accordance with paragraph 7-10. Refer to field maintenance.

#### Section III. PREVENTIVE MAINTENANCE SERVICES

###### 3-5. General

To insure that the air conditioner is ready for operation at all times, it must be inspected systematically so that defects may be discovered and corrected before they result in serious damage or failure. The necessary preventive maintenance services to be performed are listed and described in paragraphs 3-6 and 3-7. Item numbers indicate the sequence of minimum inspection requirements. Defects discovered during operation of the unit shall be noted for future correction, to be made as soon

as operation has ceased. Stop operation immediately if a deficiency is noticed which would damage the equipment if operation were continued. All deficiencies and shortcomings will be recorded together with the corrective action taken on DA Form 2404 at the earliest possible opportunity.

###### 3-6. Daily Preventive Maintenance Services

This paragraph contains an illustrated tabulated listing of preventive maintenance services which must be performed by the operator.

The item numbers are listed consecutively and indicate the sequence of minimum requirements. Refer to figure 3-1 for the daily preventive maintenance services.

### **3-7. Quarterly Preventive Maintenance Services**

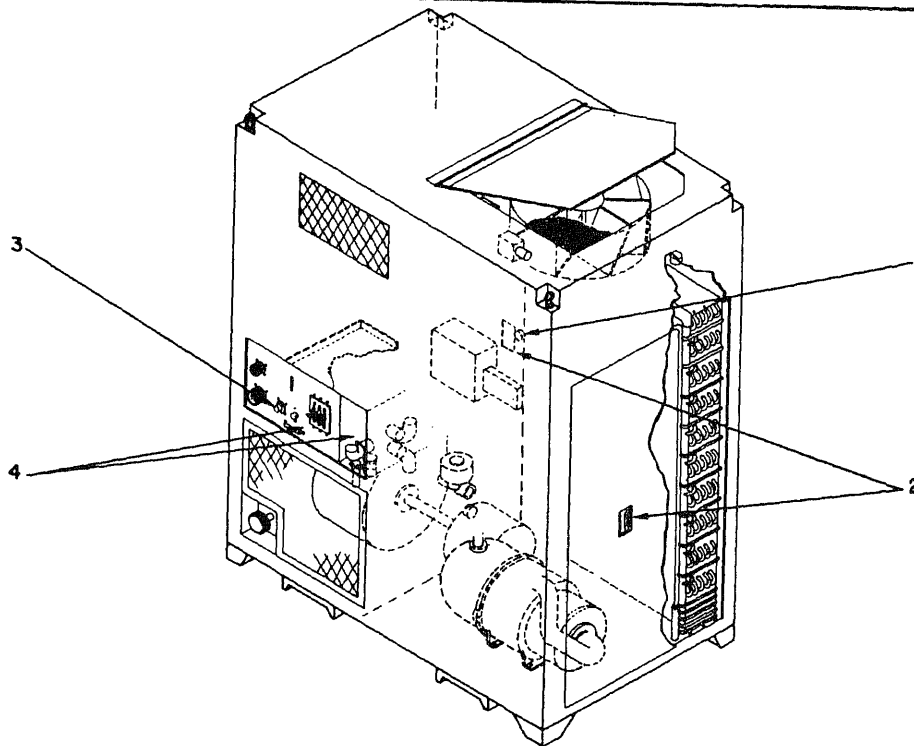
a. This paragraph contains an illustrated tabulated listing of preventive maintenance services which must be performed by organi-

zational maintenance personnel at quarterly intervals. A quarterly interval is equal to 3 calendar months, or 1800 hours of operation, whichever occurs first.

b. The item numbers are listed consecutively and indicate the sequence of minimum requirements. Refer to figure 3-2 for the quarterly preventive maintenance services.

*Note.* The motor compressor will be replaced and overhauled at 4000 hours of operation (para 5-20).

# PREVENTIVE MAINTENANCE SERVICES DAILY



ITEM		PAR REF
1	<u>REFRIGERANT LIQUID SIGHT GLASS.</u> Inspect refrigerant liquid sight glass while the unit is operating. Milky flow indicates moisture; bubbles indicate low charge—report either condition to organizational maintenance.	2-9. <u>c.</u> (1) 5-19. <u>a.</u> , <u>b.</u>
2	<u>FILTER CLEAN INDICATORS.</u> Inspect the filter clean indicators while the air conditioner is operating. Clean or replace the evaporator and/or condenser air inlet filter when indicator ball rises to SERVICE position.	2-9. <u>c.</u> (2) 2-9. <u>c.</u> (3) 3-10. 3-11.

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Figure 3-1(1). Daily preventive maintenance services.

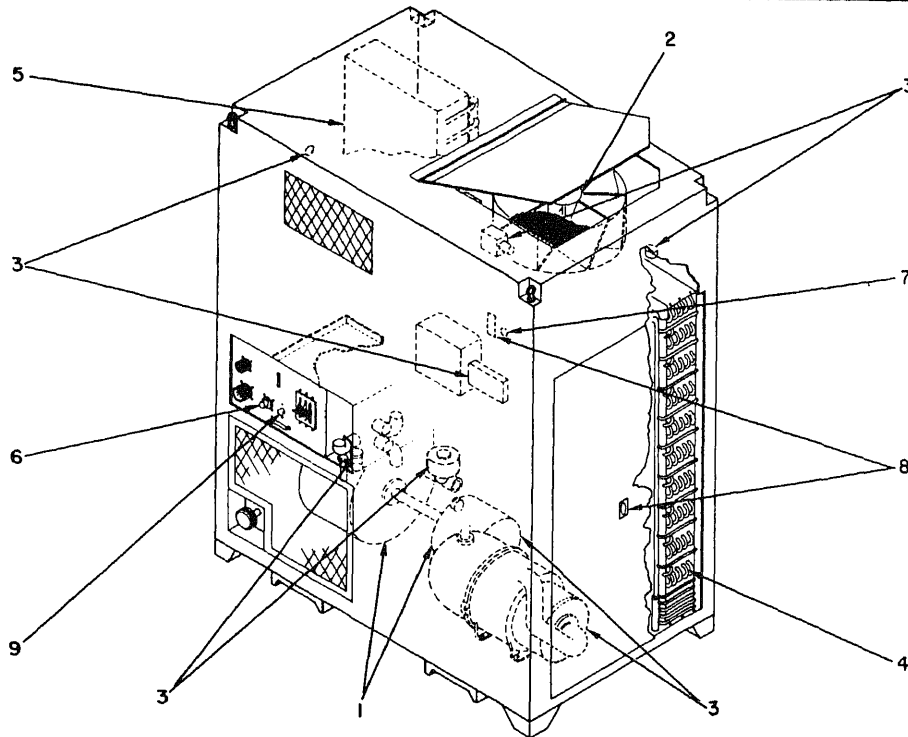
ITEM		PAR REF
3	<u>FUSE.</u> Inspect the fuse holder. If the indicator light is glowing, fuse is defective. Replace a defective fuse.	2-9. <u>b.</u> (4) 3-9.
4	<u>CONTROLS AND INSTRUMENTS.</u> Inspect for damage. With unit operating, inspect for improper operation.	2-10. 2-11. 2-12.
	<p data-bbox="409 606 1130 1050"><u>NOTE 1. MIST ELIMINATOR.</u> The mist eliminator will generally not require servicing as only filtered air reaches it. Also, cleaning the evaporator assembly core (paragraph 3-34) effectively cleans the mist eliminator.</p> <p data-bbox="409 1110 1115 1322"><u>NOTE 2. OPERATION.</u> During operation, observe for any unusual noise or vibration. Notify organizational maintenance of erratic operation.</p>	

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Figure 3-1(2)—Continued.



# PREVENTIVE MAINTENANCE SERVICES QUARTERLY



ITEM		PAR REF
1	<u>EVAPORATOR FAN MOTOR.</u> Inspect for damage and freedom of movement.	6-11.
2	<u>CONDENSER FAN MOTOR.</u> Inspect for damage and freedom of movement.	6-11.
3	<u>ELECTRICAL WIRING.</u> Inspect the wiring for loose connections and cracked insulation.	2-3. a. (2), (3), (6)
4	<u>CONDENSER.</u> Inspect for leaks, corrosion, dust and dirt.	3-10. 5-21.

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Figure 3-2 (1). Quarterly preventive maintenance services.

ITEM		PAR REF
5	<u>EVAPORATOR.</u> Inspect for leaks, corrosion, dust and dirt.	3-11. 5-21. 5-20.
6.	<u>FUSE.</u> Inspect the fuse holder. If the indicator light is flowing, fuse is defective. Replace a defective fuse.	2-9. <u>b.</u> (4) 3-37.
7	<u>REFRIGERANT LIQUID SIGHT GLASS.</u> Inspect the refrigerant liquid sight glass while the unit is operating. Milky flow indicates moisture in the refrigerant system; bubbles indicate low charge.	2-9. <u>c.</u> (1) 5-19. 5-21. 5-20.
8	<u>FILTER CLEAN INDICATORS.</u> Inspect the filter clean indicators while the air conditioner is operating. Clean or replace the evaporator and/or condenser air inlet filter when indicator ball rises to SERVICE position.	2-9. <u>c.</u> (2) 2-9. <u>c.</u> (3) 3-32. 3-33. 3-34. 3-35.
9	<u>CONTROLS AND INSTRUMENTS.</u> Inspect for damage. With air conditioner operating, inspect for improper operation.	2-10. 2-11. 2-12.
	<u>NOTE 1. OPERATIONAL TEST.</u> During operational test, observe for any unusual noise or vibration.	

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Figure 3-2 (2)—Continued.

## Section IV. OPERATOR'S MAINTENANCE

### 3-8. General

Instructions in this section are published for the information and guidance of the operator to maintain the air conditioner.

### 3-9. Fuse Replacement

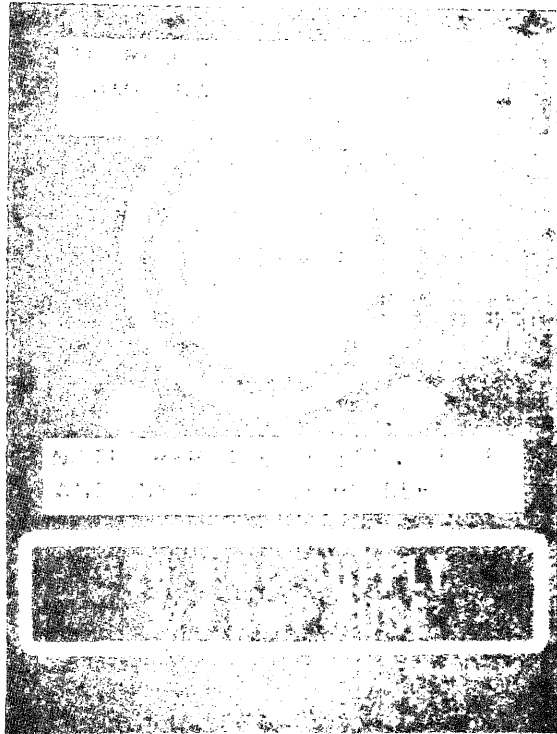
When the fuse holder indicator lights, refer to figure 3-3 and replace the fuse.

### 3-10. Condenser Air Inlet Filter Service

Refer to figure 3-4 and service the condenser air inlet filter.

### 3-11. Evaporator Air Inlet Filter Service

Refer to figure 3-5 and service the evaporator air inlet filter.



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*Figure 3-3. Fuse replacement.*



1. Remove the filter from the condenser unit by pulling it out of the frame.

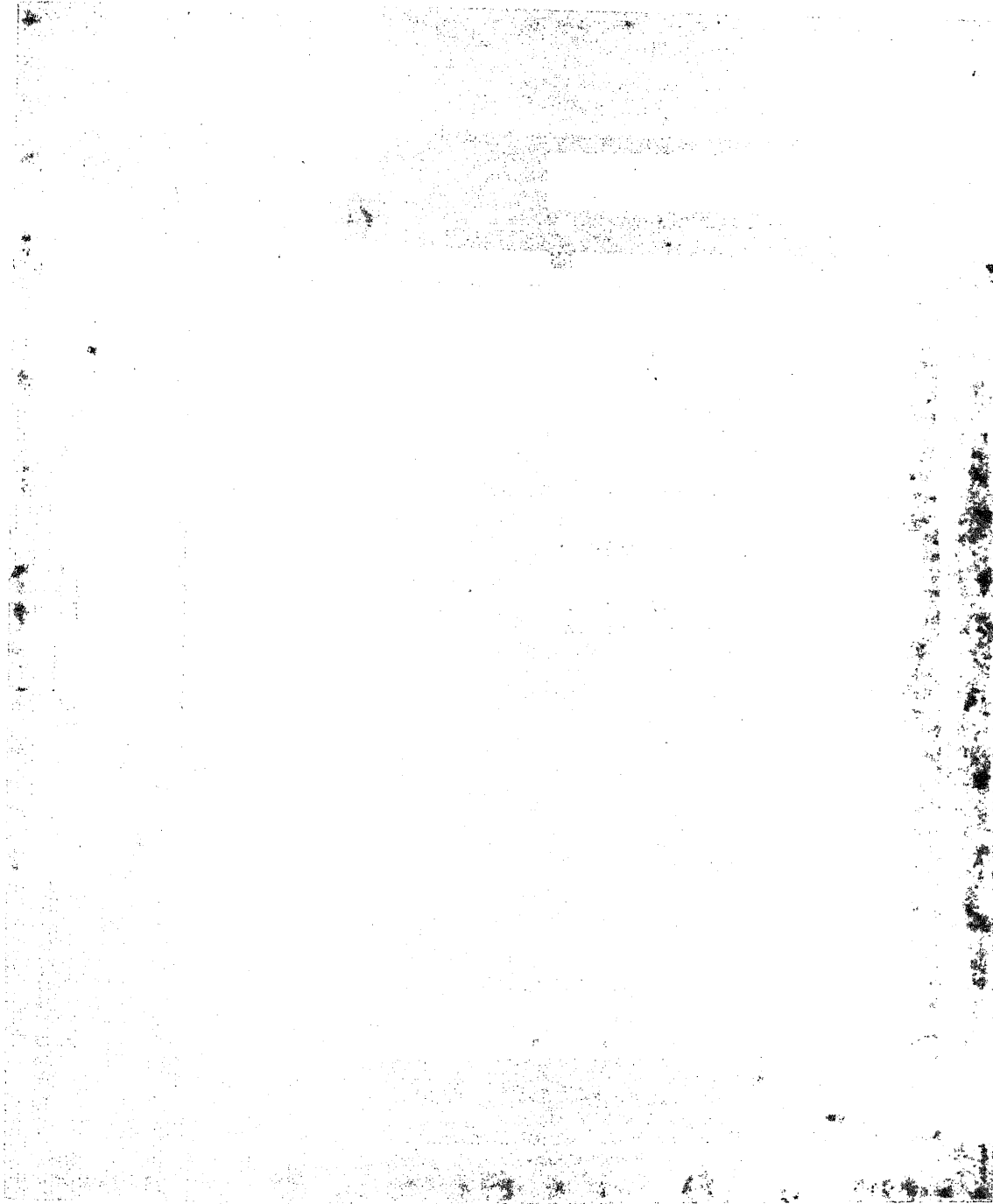
2. Inspect the filter for damage or dirt. If the filter is damaged or dirty, it should be replaced.

3. Replace the filter in the condenser unit and tighten the screws.

NOTE: REPLACE A DEFECTIVE OR DAMAGED FILTER.

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*Figure 3-4. Condenser air inlet filter service.*



*Figure 3-5. Evaporator air inlet filter service.*

## Section V. TROUBLESHOOTING

## 3-12. General

This section provides information useful in diagnosing and correcting unsatisfactory operation or failure of the air conditioner and its components. Each trouble symptom stated is followed by a list of probable causes. The possible remedy recommended is described opposite the probable causes. Any trouble beyond the scope of organizational maintenance shall be reported to direct support maintenance.

## 3-13. Air Conditioner Fails to Start

No operation in any control position.

Probable cause	Possible remedy
Interrupted power supply	Check line side of power cable. If not reading, check main power supply.
Main power cable not properly secured, or cable damaged.	Check power input cable and check (J101 and P101) for continuity and positive connection.
Fuse blown	Replace fuse (para 3-9).
Power supply out of phase.	Correct phasing of power supply (para 2-4a(6)).

## 3-14. Insufficient Cooling

Air conditioner operating with air conditioning switch in COOL position.

Probable cause	Possible remedy
Remote control box temperature control variable resistor set above ambient.	Move variable resistor further down the scale toward COOL position.
Condenser assembly, or inlet filter obstructing air flow.	Check condenser section filter clean indicator; service condenser assembly and inlet filter as required (para 3-33, and 3-35).
Evaporator air inlet filter obstructing air flow.	Check evaporator filter clean indicator; service evaporator assembly and inlet filter as required (para 3-32 and 3-34).
Low refrigerant-12 charge.	Check refrigerant liquid sight indicator; notify direct support maintenance if flow through indicator appears milky or contains bubbles (para 2-9c(1)).

Probable cause	Possible remedy
Compressor and/or condenser drive motors shut down.	Allow a few minutes for motor windings to cool down; then press system reset switch.
Condenser or evaporator fan motors shut down.	Internal motor overload relay tripped. Motor will start up automatically when cooled. Notify direct support maintenance if motor does not restart in a few minutes.
Defective thermostat	Replace thermostat (para 3-39).
Defective remote control	Replace remote control box assembly and/or wiring harness.

## 3-15. Air Conditioner Stops

Probable cause	Possible remedy
Power failure	Inspect power source cable for defects or external power source for proper operation.
Fuse blown	Replace fuse (para 3-9).
Master circuit breaker tripped.	Set master circuit breaker to OFF position; after a few minutes set to ON position. If air conditioner does not start notify direct support maintenance.
Trip relay K101 energized	Press system reset switch.

## 3-16. Compressor Noisy

Probable cause	Possible remedy
Insufficient oil or refrigerant supply, or defective compressor.	Notify direct support maintenance.

## 3-17. Compressor Stops

Probable cause	Possible remedy
Condenser or condenser air inlet filter-dirty.	Check condenser section filter clean indicator; service or replace filter and clean condenser and sub-cooler assembly as required (para 3-33).
Air in refrigerant system	Check refrigerant liquid sight indicator; if refrigerant flow appears milky or contains bubbles notify direct support maintenance.

**18. Excessive Cooling**

Probable cause	Possible remedy
Temperature control variable resistor set too low.	Adjust variable resistor for higher temperature.
Thermostat defective	Replace thermostat (para 3-39).

**19. Excessive Heating**

Probable cause	Possible remedy
Temperature control variable resistor set too high.	Adjust variable resistor for lower temperature.
Thermostat defective	Replace thermostat (para 3-39).

**3-20. No Temperature Regulation in any Control Position**

Probable cause	Possible remedy
Thermostat faulty	Replace thermostat (para 3-39).
Temperature control variable resistor (located in remote control box) defective.	Replace temperature control variable resistor.
Defective remote control box wiring harness.	Replace wiring harness connecting remote control box assembly to electrical tray panel (para 3-41).

**Section VI. HOUSING PANELS****21. General**

The air conditioner is enclosed with sheet aluminum panels mounted to the frame with quarter-turn stud fasteners, or phillips and bolts. Evaporator section housing panels are insulated with layers of sponge rubber cemented directly to the interior face of the panels. All panel contact edges are sealed with continuous strip of ribbed gasket material. The air inlets and outlets have removable expanded metal screens spot-welded to their respective panel assemblies.

**22. General Maintenance Procedures**

The following procedures pertain to all panel assemblies installed on the air conditioner. Procedures peculiar to a particular panel assembly are included within the paragraph dealing with that panel assembly.

**Caution:** Before removing or installing any panel assembly disconnect the power source from the air conditioner.

**a. Cleaning.** Clean all parts with an approved cleaning solvent.

**b. Inspection.**

- (1) Inspect the panel assembly for dents, cracks, and other signs of structural damage.
- (2) Inspect insulation and gaskets for security, damage, and deterioration.
- (3) Check the stud fasteners for broken, missing, or missing cross pins, washers, springs, seals.

- (4) Inspect the panel assembly for chipped and worn paint.

**c. Repair and Replacement.**

(1) Panel assemblies. Repair or replace a damaged panel assembly if the damage is such that the assembly does not seal properly against the frame assembly; permitting the air conditioner interior to be contaminated by foreign matter or the elements. Refer damage beyond scope of organizational maintenance to direct support maintenance.

(2) Insulation and Gaskets. Panel assemblies which have damaged insulation and/or gaskets must be repaired, see maintenance allocation chart for scope of organizational maintenance. If the insulation or gasket is loose, it can be fastened with cement, MIL Spec MIL-C-4003.

(3) Quarter-turn fastener assembly. Replace damaged stud fasteners (fig. 3-6) as follows:

(a) Compress the stud fastener and remove it from the panel grommet assembly.

(b) Remove the stud assembly seal from the stud fastener grommet.

(c) Install a new seal on the stud assembly spring cup.

(d) Compress the stud fastener and install it in the panel grommet assembly.

(4) Repaint worn, chipped, or peeling paint as follows:

(a) Remove loose paint with a wire brush.

(b) Clean the area to be repainted.

(c) Paint the area with zinc chromate primer, MIL Spec MIL-P-6889A, type I.

(d) After the primer dries, paint with one coat of semi-gloss olive drab per MIL Spec MIL-T-704, Type A. Color to be in accordance with Federal Specification TT-E-485C, Type II, Color Number X24087.

### 3-23. Evaporator Left-side Access Panel Assembly

*a. Removal.* Remove the eighteen phillips head screws (8, fig. 3-7) securing the panel assembly (5) to the cabinet; then remove the panel assembly from the air conditioner frame.

*b. Inspection, Cleaning, Repair and Replacement.* Perform the applicable procedures of paragraph 3-22.

*c. Installation.* Secure the panel assembly (5) to the air conditioner frame with the phillips head screws (8).

### 3-24. Evaporator Blower Access Panel Assembly

*a. Removal.* Remove the eighteen phillips head screws (4, fig. 3-7) securing the panel assembly (1) to the cabinet; then remove the panel assembly from the air conditioner frame.

*b. Inspection, Cleaning, Repair and Replacement.* Perform the applicable procedures of paragraph 3-22.

*c. Installation.* Secure the panel (1) to the air conditioner frame with the phillips head screws (4).

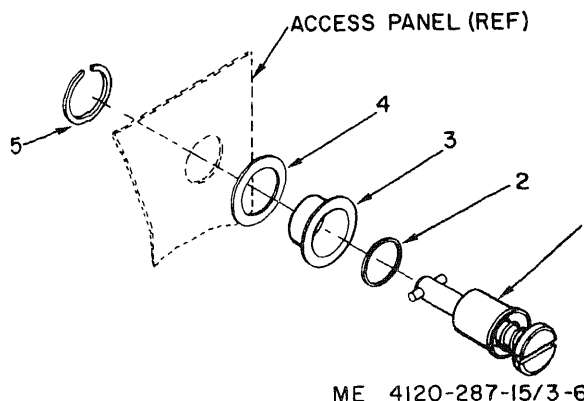
### 3-25. Electrical Tray Access Panel Assembly

*a. Removal.* Remove the twelve phillips head screws (11, fig. 3-7) securing the panel assembly (9) to the cabinet; then remove the panel assembly from the air conditioner frame.

*b. Inspection, Cleaning, Repair and Replacement.* Perform the applicable procedures of paragraph 3-22.

*c. Installation.* Secure the panel assembly (5) to the air conditioner frame with the phillips head screws (11).

3-12



- |                     |             |
|---------------------|-------------|
| 1 Stud assembly     | 4 Washer    |
| 2 Preformed packing | 5 Snap ring |
| 3 Grommet           |             |

Figure 3-6. Quarter-turn fastener assembly.

### 3-26. Thermostat Access Panel

*a. Removal*

(1) Remove the electrical tray access panel according to paragraph 3-25a.

(2) Remove the seven phillips head screws (13, fig. 3-7) securing the thermostat access panel (12) to the cabinet; then remove the thermostat access panel from the air conditioner frame.

*b. Inspection, Cleaning, Repair and Replacement.* Perform the applicable procedures of paragraph 3-22.

*c. Installation.* Secure the panel (12) to the air conditioner frame, using the phillips head bolts (13).

### 3-27. Evaporator Rear Access Panel

*a. Removal.* Loosen the panel's twenty quarter-turn fasteners by depressing fasteners and rotating one-quarter turn counterclockwise; then remove the panel assembly (7, fig. 3-8) from the air conditioner frame.

*b. Inspection, Cleaning, Repair and Replacement.* Perform the applicable procedures of paragraph 3-22.

*c. Installation.* Secure the panel (7, fig. 3-8) to the air conditioner frame with the quarter-turn fasteners.



### 3-28. Condenser Air Inlet Weather Cover

*a. Removal.* Remove the three phillips head screws (9, fig. 3-8) securing the weather cover (8) to the air conditioner frame; then remove the weather cover.

*b. Inspection, Cleaning, Repair and Replacement.*

(1) Perform the applicable procedures of paragraph 3-22.

(2) Replace weather cover when material thins due to weathering.

(3) Small tears may be patched with canvas until a new cover can be obtained.

*c. Installation.* Secure the weather cover (8, fig. 3-8) to the air conditioner frame with phillips head screws (9).

### 3-29. Condenser Right-side Access Panel Assembly

*a. Removal.* Loosen the panel's twenty-eight quarter-turn fasteners by depressing fasteners and rotating one quarter-turn counterclockwise; then remove panel assembly (1, fig. 3-8) from the air conditioner frame.

*b. Inspection, Cleaning, Repair and Replacement.* Perform the applicable procedures of paragraph 3-22.

*c. Installation.* Secure the panel assembly (1, fig. 3-8) to the air conditioner frame with the quarter-turn fasteners.

### 3-30. Condenser Air Discharge Door Assembly

*a. Removal.* Remove the hinge pin (6, fig. 3-8) from the condenser door hinge.

Loosen the door's four quarter-turn fasteners by depressing fasteners and rotating one-quarter turn counterclockwise; then remove the door (5, fig. 3-8) from the air conditioner.

*Note.* Do not remove condenser air discharge door assembly unless repairing or replacing door. Sufficient access is gained to components beneath door by loosening the four quarter-turn fasteners and opening door.

*b. Inspection, Cleaning, Repair and Replacement.*

(1) Perform the applicable procedures of paragraph 3-22.

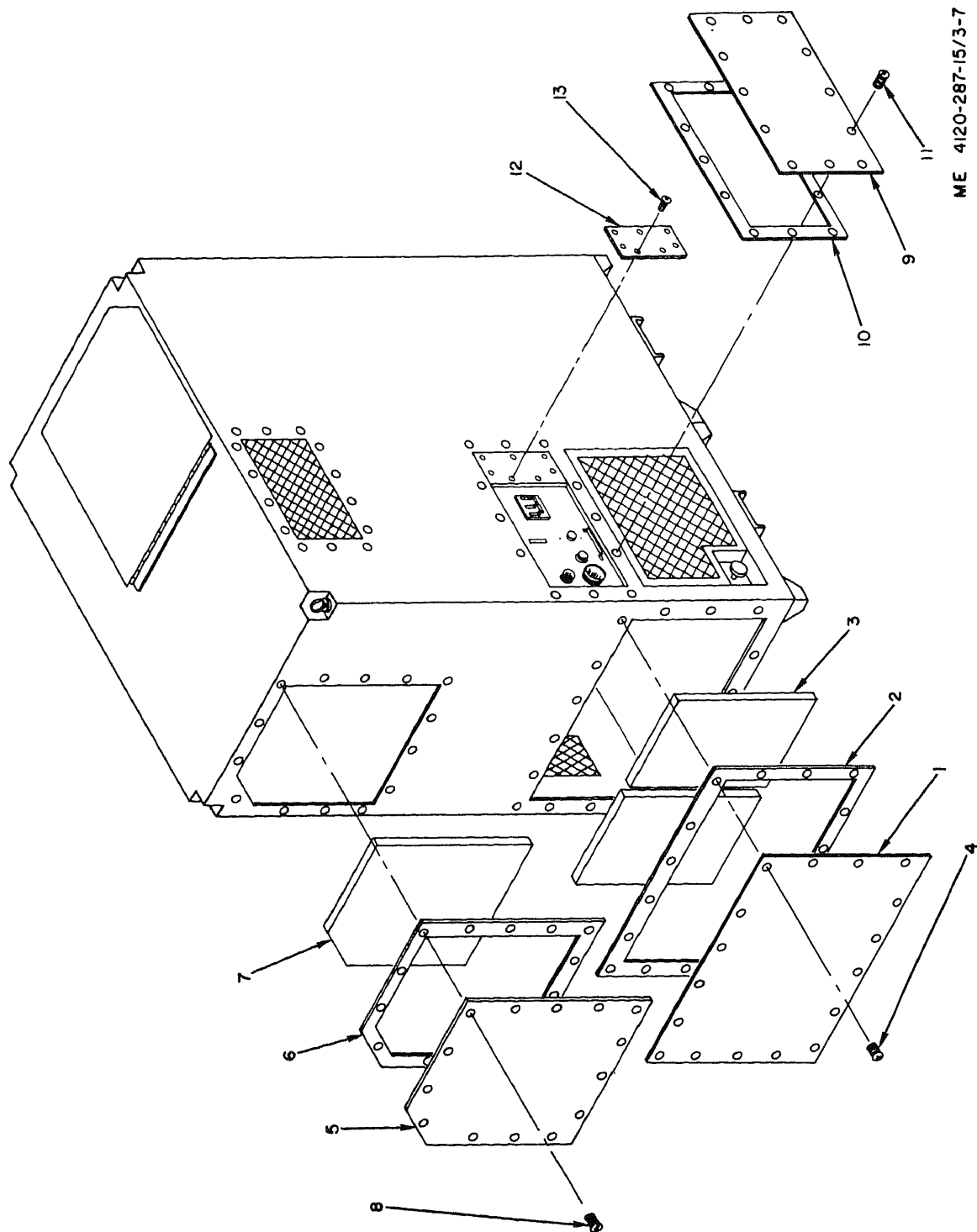
(2) Inspect the door hinges for damage and security. Inspect the hinge area for defective spot welds.

(3) Inspect the honeycomb assembly for damage and security.

*c. Installation.*

(1) Secure the door (5, fig. 3-8) to the air conditioner frame with quarter-turn fasteners.

(2) Replace condenser door hinge pin (6, fig. 3-8) if it was removed.

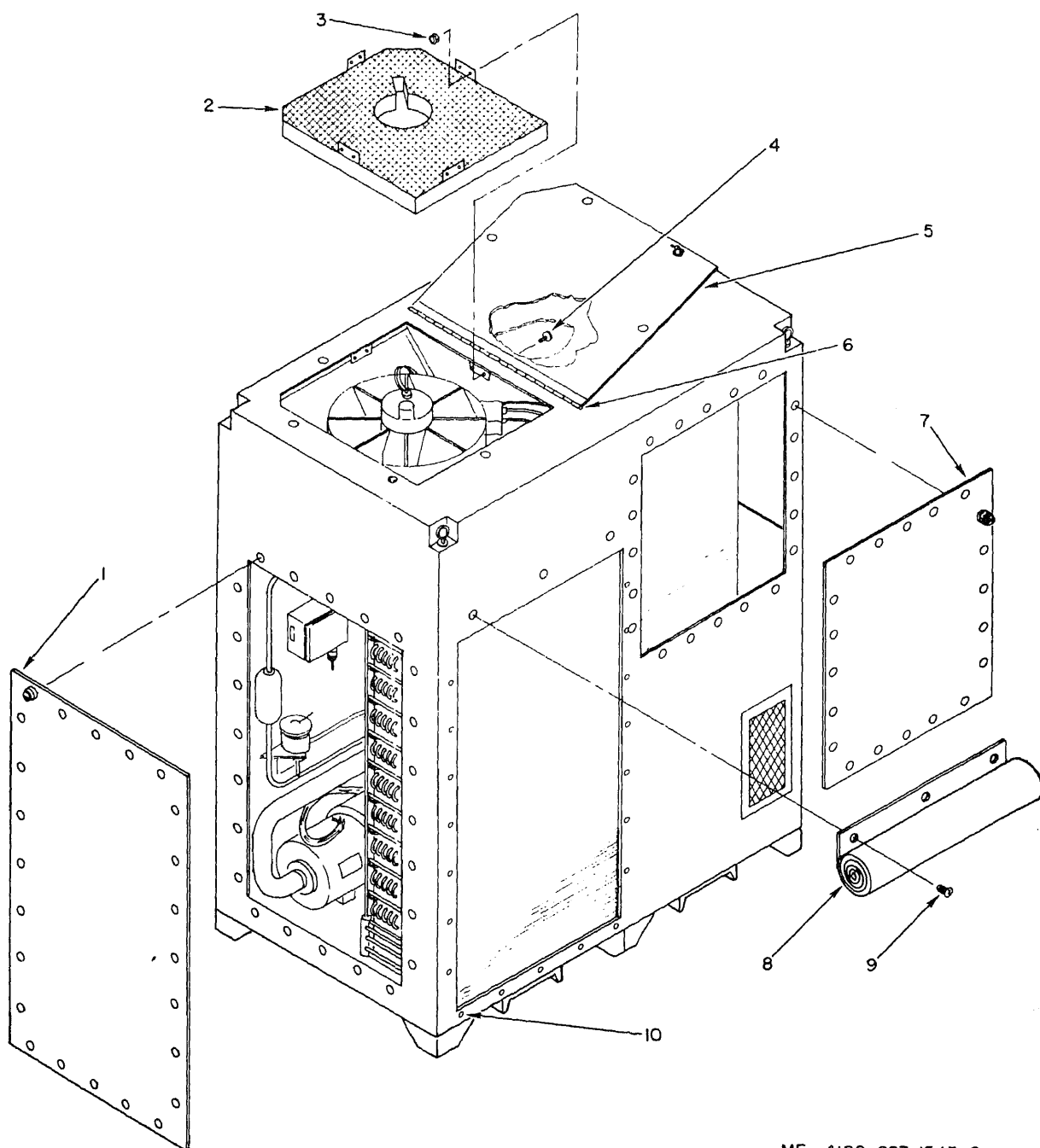


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Figure 3-7. Front and left-side panel assemblies, exploded view.

- |   |                                          |    |                              |    |                         |
|---|------------------------------------------|----|------------------------------|----|-------------------------|
| 1 | Evaporator blower left-side access panel | 6  | Gasket                       | 11 | Phillips screw (12)     |
| 2 | Gasket                                   | 7  | Insulation                   | 12 | Thermostat access panel |
| 3 | Insulation                               | 8  | Phillips screw (18)          | 13 | Phillips screw (7)      |
| 4 | Phillips screw (18)                      | 9  | Electrical tray access panel |    |                         |
| 5 | Evaporator left-side access panel        | 10 | Gasket                       |    |                         |

Figure 3-7—Continued.



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- |                                              |                                              |
|----------------------------------------------|----------------------------------------------|
| 1 Condenser right-side access panel assembly | 6 Hinge pin                                  |
| 2 Honeycomb                                  | 7 Evaporator rear access panel assembly      |
| 3 Nut (8)                                    | 8 Condenser air inlet weather cover assembly |
| 4 Screw (8)                                  | 9 Screw (3)                                  |
| 5 Condenser air discharge door assembly      | 10 Snap fastener button (19)                 |

Figure 3-8. Air conditioner right-side and rear panel assemblies and top door assembly, exploded view.

## Section VII. AIR CIRCULATION SYSTEM

### 3-31. General

*a. Operator and Organizational Maintenance Services.* Operator and organizational maintenance of the air circulation system is limited to cleaning the evaporator and condenser assembly core fins, cleaning or replacing the evaporator and condenser section inlet air filters, and maintaining the evaporator outlet duct assembly.

*b. Evaporator Section.* The evaporator blower (fan) circulation system is integral with the evaporator recirculating air intake and conditioned air delivery ductwork. The delivery side of the blower distributes cooled, heated, or ambient recirculating air to the shelter area as determined by the mode in which the air conditioner is operating.

The total evaporator blower discharge (delivered) air flow passes through the evaporator inlet air filter before being conditioned and passed on to the conditioned air duct leading into the shelter.

*c. Condenser Section.* The condenser circulation fan, located in the top of the condenser section, exhausts warm air from the condenser assembly enclosure; thus drawing outdoor ambient air through the condenser inlet filter. The condenser inlet air filter protects the condenser and subcooler assembly core fins, and various other vapor cycle components located in the condenser section from dirt and foreign particles.

*d. Filter Clean Indicator.* The filter clean indicators measure the air flow through the air filters. When air flow through either the condenser or evaporator section is restricted sufficiently to affect air conditioning capacity the filter clean indicator ball rises to the SERVICE pointer. When a service condition exists the effected air filter and/or core assembly must be serviced.

### 3-32. Evaporator Air Inlet Filter

#### *a. Removal.*

(1) Remove the evaporator rear access panel assembly (para 3-27a).

(2) Remove the three air filter retaining clip hex nut fasteners (fig. 3-5); then remove the air filter retaining clips.

(3) Remove the air filter from the evaporator section air conditioner frame assembly.

#### *b. Cleaning, Inspection, and Replacement.*

(1) Clean the air filter with an approved cleaning solvent; and dry with compressed air.

(2) Inspect the air filter for cracks, breaks, and distortion. Replace a damaged air filter.

(3) Inspect the air filter retaining clips and hex nut fasteners for serviceability. Replace defective clips.

#### *c. Installation.*

(1) Position the air filter in the air conditioner evaporator section (fig. 3-5).

(2) Place the three air filter retaining clips in position against the air filter and tighten the three hex nut fasteners.

(3) Install the evaporator rear access panel assembly (para 3-27).

### 3-33. Condenser Air Inlet Filter

#### *a. Removal.*

(1) Roll up and tie the condenser air inlet weather cover to provide unobstructed access to the air filter.

(2) Remove the six air filter retaining clip hex nut fasteners (fig. 3-4); then remove the air filter retaining clips.

(3) Remove the air filter from the condenser section air conditioner frame assembly.

#### *b. Cleaning, Inspection, and Replacement.*

(1) Clean the air filter with an approved cleaning solvent; and dry with compressed air.

(2) Inspect the air filter for cracks, breaks, and distortion. Replace a damaged air filter.

(3) Inspect the air filter retaining clips and hex nut fasteners for serviceability. Replace defective clips.

#### *c. Installation.*

(1) Position the air filter in the air conditioner condenser section (fig. 3-4).

(2) Place the six air filter retaining clips in position against the air filter and tighten the six hex nut clip fasteners.

(3) Roll down condenser air inlet weather cover; then using the snap fasteners (fig. 3-4) secure weather cover to air conditioner frame.

### 3-34. Evaporator Assembly

a. Remove the evaporator rear access panel and air inlet filter (para 3-22a).

b. Clean the core fins of the evaporator assembly with compressed air.

c. Install the air filter and evaporator rear access panel (para 3-32c).

### 3-35. Condenser Assembly

a. Roll up condenser air inlet weather cover and remove air inlet filter (para 3-33a).

b. Remove the condenser right-side access panel assembly (para 3-9a).

c. Clean the accumulated dust and dirt from the core fins of the condenser assembly and the subcooler assembly with compressed air.

d. Install the condenser right-side access panel assembly (para 3-25c).

e. Install the air inlet filter and secure the weather cover to the air conditioner frame (para 3-33c).

## Section VIII. AIR CONDITIONER ELECTRICAL SYSTEM

### 3-36. General

Operator and organizational maintenance of the electrical system consists of replacing the fuse, fuse holder, remote control box, variable resistor, switch, harness assembly, and temperature control thermostat.

### 3-37. Electrical Tray Panel Fuse

#### a. Removal.

*Note.* If the lamp in the fuse holder (fig. 3-3) glows, it indicates that the fuse is blown and must be replaced.

(1) Push inward on fuse holder (fig. 3-3) and rotate it counterclockwise. Remove the fuse and the fuse holder.

(2) Remove fuse from fuse holder.

#### b. Cleaning, Inspection, and Testing.

(1) Wipe the fuse holder and fuse clean with a dry cloth.

(2) Inspect the fuse holder for cracks and distortion. Test the fuse for continuity with a test lamp. Replace an unserviceable fuse or fuse holder.

c. *Installation.* Insert fuse holder (fig. 3-3) with a 3/4 ampere 600 volt fuse installed, into the electrical tray panel. Press the fuse holder and turn it clockwise to secure it in position.

### 3-38. Remote Control Box Assembly and Wiring Harness

#### a. Removal.

(1) See that the main power source is disconnected.

(2) Disconnect wiring harness from remote control box assembly (J103) and from electrical tray remote control receptacle (J102).

#### b. Cleaning, Inspection, and Repair.

(1) Wipe the wiring harness assembly and the box assembly with a clean, dry cloth (fig. 2-2).

(2) Inspect the wiring harness assembly for frayed or defective insulation and for loose or broken terminals.

(3) Inspect the box assembly for cracks, a defective switch, and for loose or missing hardware.

(4) Repair or replace an unserviceable wiring harness assembly.

(5) Replace a damaged or unserviceable remote control box assembly.

#### c. Installation.

(1) Connect remote control wiring harness plug (P103) to remote control bolt assembly receptacle (J103).

(2) Connect remote control wiring harness plug (P102) to electrical panel remote. Control receptacle (J102).

(3) Connect main power supply plug (P101) to electrical tray panel power input receptacle (J101).

### 3-39. Thermostat

#### a. Removal.

(1) Remove the thermostat access panel (para 3-26a).

(2) Loosen terminal board (TB2) lug screws 1, 2, and 3 (2, 3 and 4, fig. 3-9); and remove thermostat leads from terminal board.

(3) Remove the two thermostat hold down phillip screws (6) by turning counter-clockwise; then remove the thermostat (5) from the air conditioner frame.

*b. Cleaning, Inspection, and Replacement.*

(1) Wipe the thermostat, thermostat leads, and terminal board with a clean, dry cloth.

(2) Inspect the thermostat for cracks,

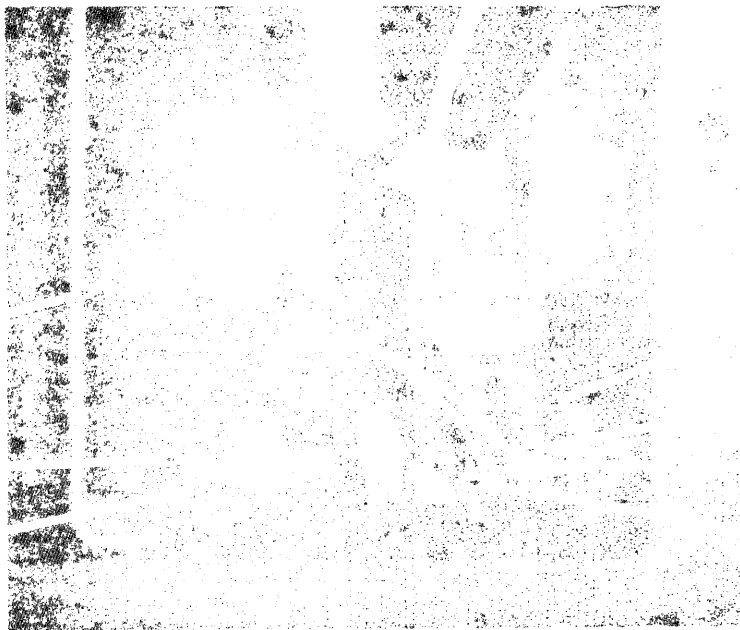
breaks, and distortion. Check for integrity of thermostat lead insulation. Replace a defective thermostat.

*c. Installation.*

(1) Install thermostat (5, fig. 3-9) using the two phillips head screws (6).

(2) Connect thermostat black, red, and white leads to terminal board TB2 connectors 1, 2, and 3 (4, 3, and 2, fig. 3-9) respectively.

(3) Install thermostat access panel (para 3-26c).



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- 1 Terminal board TB-2
- 2 White thermostat lead
- 3 Red thermostat lead

- 4 Black thermostat lead
- 5 Thermostat
- 6 Phillips head bolt (2)

- 7 Arbor nut plate (7)

*Figure 3-9. Thermostat replacement.*

## Section IX. TEMPERATURE CONTROL SYSTEM

### 3-40. General

The temperature control system consists of the remote control box containing the air conditioning switch (para 2-8a) and temperature

control variable resistor (para 2-8a), current limiting resistor, cycling resistor, cycling capacitor, temperature control relay and the temperature control thermostat.

### 3-41. Remote Control Box Wiring Harness

#### *a. Removal.*

(1) Make sure input power plug P101 is disconnected from electrical tray panel input power receptacle J101.

(2) Disconnect remote control box harness from the remote control box and from the electrical tray panel remote control receptacle.

#### *b. Inspection and Testing.*

(1) Inspect remote control box harness assembly for physical defects in accordance with paragraph 3-38b. Replace a defective harness assembly.

(2) Test for electrical defects as follows:

(a) Using a multimeter or test lamp, test for continuity of individual harness wires by placing one test lead on harness plug P102,

prong A; and the other test lead on plug P103, prong A. Continue testing P102 and P103 positions B, C, D, E, F, G, H, J, K, and L, in this manner. Make sure that the test leads are on plug P102's and P103's associated prongs (A-A, B-B, C-C thru L-L) while observing for multimeter needle deflection or test lamp glow. Replace the remote control harness assembly should the multimeter or test lamp indicate discontinuity in one or more of the above tests.

#### *c. Installation.*

(1) Connect the harness to the remote control box and electrical tray panel remote control receptacle.

(2) Connect input power plug P101 to electrical tray panel input power receptacle J101.



## CHAPTER 4

### DIRECT AND GENERAL SUPPORT AND DEPOT MAINTENANCE INSTRUCTIONS

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#### Section I. GENERAL

##### 4-1. Scope

These instructions are published for the use of direct and general support and depot maintenance personnel maintaining the air conditioner. They provide information on the maintenance of the equipment, which is beyond the scope of tools, equipment, personnel, or supplies normally available to using organizations.

##### 4-2. Record and Report Forms

For other record and report forms applicable to direct and general support and depot maintenance, refer to TM 38-750.

*Note.* Applicable forms, excluding Standard Form 46 which is carried by operator, shall be kept in a canvas bag mounted on equipment.

#### Section II. DESCRIPTION AND TABULATED DATA

##### 4-3. Description

For a complete description of the air conditioner see paragraph 1-3.

##### 4-4. Tabulated Data

Refer to paragraph 1-4b for tabulated data.



## CHAPTER 5

### GENERAL MAINTENANCE INSTRUCTIONS

#### Section I. SPECIAL TOOLS AND EQUIPMENT

##### 5-1. Special Tools and Equipment

No special equipment is required by direct and general support and depot maintenance personnel for performing maintenance on the air conditioner.

##### 5-2. Specially Designed Tools and Equipment

No specially designed tools or equipment are required by direct and general support and depot maintenance personnel for performing maintenance on the air conditioner.

#### Section II. TROUBLESHOOTING

##### 5-3. General

This section provides information useful in diagnosing and correcting unsatisfactory operation or failure of the air conditioner or any of its components. Each trouble symptom stated is followed by a list of probable causes. The possible remedy recommended is described opposite the probable cause.

##### 5-4. Unit Inoperative (No operation in any control position)

Probable Cause	Possible Remedy
Fuse F1 blown, or no fuse in 28 VDC circuit.	Check fuse for continuity; replace if necessary (para 3-37). Recurrent fuse failure indicates a short in 28VDC circuit. Check wiring for continuity and shorts. (para 6-9b(1)).
Trip relay K101 tripped (energized).	Press system reset switch. Restart according to paragraph 2-10. Check trip relay (para 6-9c(1)).
Main power cable not properly secured, or cable damaged.	Check power input cable and connector (J101 and P101) for continuity and positive connection.
Interrupted power supply	Check line side of power cable; if not reading check main power supply.

Probable Cause	Possible Remedy
Remote control cable not properly secured, or cable damaged.	Check cable connectors J102 and J103 for continuity and positive connection.
Remote control box inoperative.	Check temperature control switch and air conditioning switch repair or replace control box as necessary (para 6-1 through 6-4).
Master circuit breaker (CB1) defective.	Check circuit breaker; replace if necessary (para 6-9a).
Defective silicon rectifier (CR1).	Check rectifier for opens, shorts and proper output; replace if necessary (para 6-9b(4)).
Power supply connected out of phase.	Check phase; correct as necessary (para 2-4a(8)).
Defective power transformer (T1).	Check transformer for opens, shorts and proper output; replace if necessary (para 6-9b(3)).
No primary input at power transformer.	Phase sequence relay (K108) defective, or wrong relay installed. Check relay; replace as necessary (para 6-9b(2)).

##### 5-5. Air Conditioner Stops

Probable Cause	Possible Remedy
Refer to probable cause column of paragraph 5-4.	Refer to possible remedy column of paragraph 5-4.

## 5-6. No (or insufficient) Heating

Probable Cause	Possible Remedy
Temperature control variable resistor set below ambient.	Turn variable resistor knob toward WARM.
Refer to probable cause column of paragraph 5-4.	Refer to possible remedy column of paragraph 5-4.
Defective or damaged thermostat (S105).	Substitute new component in place of suspected faulty thermostat (para 6-6e).
Heater line contactor relay (K107) defective.	Checkline contactor relay; replace if defective (para 6-9c(4)).
Defective temperature control relay (K103).	Substitute new component in place of suspected faulty thermo relay. (para 6-9c(3)).
Heater temperature switch (S104) defective.	With ambient temperature below 125°F, check terminal B and D of plug P112 for continuity. Replace switch S104 if defective. If heaters cut-out below 125°F substitute new component for S104 (para 6-6d).
Evaporator blower not functioning, causing S104 to trip.	Check evaporator blower line contactor relay (K106); replace if defective (para 6-9c(4)).
Current limiting fixed resistor (R1) shorted, causing K103 coil to energize at excessively low temperatures—cutting off heaters.	Check resistor R1 for open or short condition. Check for 350 ohms resistance across R1; replace resistor R1 if defective (para 6-10, and fig. 1-9).

## 5-7. No (or insufficient) Cooling

Probable Cause	Possible Remedy
Condenser discharge door closed, or defective microswitch (S101).	Open condenser door, make sure microswitch is operative; replace a defective microswitch (para 6-6a).
Condenser-subcooler assembly core and/or filter dirty.	Check condenser filter clean indicator; service as required (para 3-33 and 3-35).
Evaporator assembly core and/or filter dirty.	Check evaporator filter clean indicator; service as required (para 3-32 and 3-34).
Low refrigerant charge	--Check refrigerant charge level (para 2-8c(1)). If necessary, add refrigerant-12 to system (para 7-5).

Probable Cause	Possible Remedy
Condenser or evaporator motor internal overload relay tripped.	Motor re-starts automatically when cooled. No action necessary. If condition recurs frequently, determine cause and correct. Test motors as necessary (para 6-13).
Defective evaporator fan line contactor relay (K106).	Check line contactor relay. Replace if necessary (para 6-9c(4)).
Defective condenser fan line contactor relay (K105).	Check line contactor relay. Replace if necessary (para 6-9c(4)).
Defective compressor motor line contactor relay (K104).	Check line contactor relay. Replace if necessary (para 6-9c(4)).
Defective time delay relay (K102).	Check time relay (K102); replace if defective (para 6-9c(2)).
Current limiting fixed resistor (R1) open, preventing temperature control relay (K103) coil from energizing.	Check R1 for open or short condition and for 350 ohm value. Replace resistor R1 if defective (para 6-10, and fig. 1-9).
Temperature control variable resistor defective.	Check R3 (fig. 1-9) for open or short condition and resistance range. Replace if defective (para 6-3a).
Defective or damaged thermostat (S105).	Replace thermostat (para 3-39).
Defective motor compressor.	Refer to paragraphs 6-12c, 6-13, and 6-14c.
Defective condenser fan	--Refer to paragraphs 6-12b, and 6-14b.
Defective evaporator blower.	Refer to paragraphs 6-12a, 6-13, and 6-14a.
Defective refrigerant solenoid valve coil (L101) or no voltage applied to coil.	Check coil (L101). Check for 28vdc across terminals N and P of jack J108. Replace a defective coil (para 6-6f).
Defective solenoid valve	--Check sight glass for refrigerant flow (para 2-8c(1)). Check to see if tubing near valve outlet is cooler than tubing adjacent to inlet (indicating partially blocked valve) (para 7-8).
Low ambient switch (S102) defective, causing trip relay K101 to maintain tripped condition.	Check lines 109 and 111 for open condition. Replace S102 if defective (para 6-6b).

Defective thermoexpansion valve.	Replace thermoexpansion valve (para 7-21).
Defective hot gas bypass valve.	Replace bypass valve (para 7-20).
Defective liquid quench valve.	Replace quench valve (para 7-19).
Defective charge valve	Replace charge valve. (para 7-14 and 7-16).
Defective pressure relief valve.	Replace pressure relief valve (para 7-15).
Defective evaporator	Replace evaporator (para 5-27).
Defective condenser-subcooler assembly.	Replace condenser-subcooler assembly (para 5-24).

## 5-8. Excessive Cooling

Probable Cause	Possible Remedy
Defective thermostat (S105).	Check thermostat. Replace if necessary (para 3-39 and 6-6e).
Defective liquid refrigerant solenoid valve. Solenoid valve passes refrigerant after coil (L101) is deenergized.	Check for 28vdc across terminals 4 and 5 of terminal board TB1. Disconnect solenoid coil at TB1. Start up air conditioner and observe liquid refrigerant sight glass. If flow is evident, replace solenoid valve (para 7-18).

## 5-9. Motor Compressor Excesesively Noisy

Probable Cause	Possible Remedy
Defective thermoexpansion valve (allowing liquid carryover).	Replace thermoexpansion valve (para 7-21).
Defective liquid quench valve (allowing liquid carryover).	Replace liquid quench valve (para 7-19).
Defective motor compressor.	Replace motor compressor (para 5-20).

## 5-10. Motor Compressor and Condenser Fan Inoperative (All other components functioning)

Probable Cause	Possible Remedy
Trip relay K101 tripped (energized).	Press SYSTEM RESET switch (S1) (paragraph 6-9c(1)).
Condenser discharge door closed.	Open condenser discharge door.

Remote control harness assembly defective.

Low ambient temperature switch closed. High-low pressure switch closed. Compressor thermal overload switch closed. Defective remote control box assembly.

Defective trip relay (K101).

Check for continuity between identically marked terminals of plugs P102 and P103. Repair or replace a defective harness (para 3-41b). Isolate faulty switch by continuity check at terminals 1 and 2 of terminal board TB1 (fig. 1-9). Check remote control box assembly. Replace or repair a defective remote control box assembly (paragraph 6-3). Check trip relay (K101), replace if defective (para 6-9c(1)).

## 5-11. Motor Compressor Inoperative (All other components functioning)

Probable Cause	Possible Remedy
Defective line contactor relay (K104).	Check contactor; replace if necessary (para 6-9c(4)).
Connectors P105 and J105 and/or P113 and J113 and/or motor terminals not properly secured; connector or wiring harness damaged.	Check for security of attachment and integrity of connector. Check harness. Replace a damaged connector or harness assembly.
Defective time delay relay (K102).	Operate air conditioner in cooling mode. After 3 seconds check for 28vdc across relay K104 terminals X1 and X2. Replace a defective time delay relay (para 6-9c(2)).
Defective motor compressor.	Replace motor compressor (para 6-12c, 6-13, and 6-14c).

## 5-12. Condenser Fan Inoperative (All other components functioning)

Probable Cause	Possible Remedy
Defective line contactor relay (K105).	Check contactor; replace if necessary (para 6-9c(4), and 6-10).
Connectors P106 and J106 and/or P108 and J108 and/or P111 not properly secured or connectors damaged.	Check for security of attachment and integrity of connectors. Replace a damaged connector.

Probable Cause	Possible Remedy
Defective condenser fan motor.	Check condenser fan assembly; replace if necessary (para 6-11b, 6-13, and 6-14b).

### 5-13. Evaporator Blower Inoperative (All other components functioning)

Probable Cause	Possible Remedy
Defective line contactor relay (K106).	Check contactor; replace if defective (para 6-9c(4) and 6-10).
Connectors P107 and J107 and/or P109 and J109 and/or P110 not properly secured; connector, or wiring harness damaged.	Check for security of attachment and integrity of connector. Check harness. Replace or repair a damaged connector or harness assembly.
Defective evaporator blower motor.	Check evaporator blower motor; replace if necessary, (para 6-12a, 6-13, and 6-14a).

### 5-14. Trip Relay K101 Recurrently Trips

Probable Cause	Possible Remedy
Defective high-low pressure switch (S103).	Adjust or replace as necessary (para 6-6c).
Defective compressor motor thermal overload.	Replace motor compressor assembly (para 5-20).
Defective low ambient temperature switch (S102).	Replace low ambient temperature switch (para 6-6b).
Intermittant short between lines 19 and 20.	Check terminal board TB1, connectors' P106, J106, P108 terminals E and D. Replace or repair defective components as necessary (fig. 1-9).
Defective trip relay (K101).	Internal intermittant short across relay K101 terminals 6 and 7. Replace if damaged (para 6-9c(1)).

## Section III. REFRIGERANT SYSTEM MAINTENANCE

### 5-15. Precautions When Handling Refrigerant

Although refrigerant-12 is one of the safest refrigerants to handle, it is important that personnel observe the following precautions in handling the refrigerant.

a. Do not discharge refrigerant-12 into areas having exposed flames. A heavy concentration of refrigerant in contact with a live flame produces a gas which is toxic and attacks bright metal surfaces.

b. Do not expose the eyes to the refrigerant. If refrigerant-12 comes in contact with eyes, observe the following instructions.

(1) Do not rub the eye(s).

(2) Arrange at once to take the affected person to an eye specialist.

(3) Put drops of sterile mineral oil into the eyes to remove the excess refrigerant.

(4) Wash the eyes with either a weak solution of boric acid or a sterile salt solution (not to exceed 2 percent sodium chloride).

c. Do not expose the skin to the liquid refrigerant. If the liquid comes in contact with the skin, treat the injury the same as though the skin has been frostbitten or frozen. If a person is overcome in an area which lacks oxygen because of the presence of a high

concentration of refrigerant-12, treat the person by applying artificial respiration produced manually or by a pulmotor.

### 5-16. Refrigerant Service Cylinder Handling Procedures

The following precautions must be observed when handling refrigerant bottles.

a. Do not leave the refrigerant bottle uncapped. All refrigerant bottles are shipped with a metal screw cap to protect the valve and safety plug from damage. Replace the cap after each use of the refrigerant bottles.

b. Do not carry or otherwise transport a refrigerant bottle in the passenger compartment of a vehicle or carrier. Do not expose the refrigerant bottle to radiant heat from the sun because the resulting increase in pressure can cause the safety plug to release or the bottle to burst.

c. Never subject the refrigerant bottle to high temperature when adding refrigerant to the air conditioning system. A bucket of hot water (not over 125°F), or hot wet rags around the bottle provides all the heat required to raise the refrigerant in the bottle to a pressure higher than the pressure in the system when adding refrigerant.

### 5-17. Checking Refrigerant Charge Level

a. Check the refrigerant liquid sight indicator (para 2-8 c. (1)). If the refrigerant system requires additional charge bubbles or a milky flow will be present in the refrigerant liquid sight indicator.

b. Operate the air conditioner for approximately 5 minutes. If the bubbles or milky flow in the refrigerant liquid sight indicator are not eliminated, add refrigerant in accordance with paragraph 7-5.

## Section IV. REMOVAL AND INSTALLATION OF MAJOR COMPONENTS

### 5-18. General

Procedures necessary for the removal and installation of all major units are described and illustrated in this section. The following major components are discussed:

- a. Electrical tray assembly (para 1-3 b).
- b. Motor compressor (para 1-3 d).
- c. Condenser fan assembly (para 1-3 g).
- d. Evaporator blower (para 1-3 q).
- e. Evaporator blower motor (para 1-3 q).
- f. Condenser-subcooler assembly (para 1-3 h).
- g. Heater assemblies (para 1-3 t).
- h. Mist eliminator (para 1-3 u).
- i. Evaporator assembly (para 1-3 p).

### 5-19. Electrical Tray Assembly

#### a. Removal.

- (1) Remove electrical tray access panel assembly (para 3-25a).
- (2) Refer to figure 5-1 and remove the electrical tray assembly.

#### b. Installation.

- (1) Refer to figure 5-1 and install electrical tray assembly by performing steps in reverse order.
- (2) Inspect and install electrical tray access panel assembly (para 3-25 b and c).

### 5-20. Motor Compressor

#### a. Removal.

- (1) Remove air conditioner right-side access panel assembly (para 3-29 a).
- (2) Discharge refrigerant system (para 7-7).
- (3) Refer to figure 5-2 and remove the motor compressor.

#### b. Installation.

(1) Refer to figure 5-2 and install the motor compressor by repeating the steps in reverse order.

(2) Charge the refrigerant system (para 7-8 and 7-9).

(3) Install air conditioner right-side access panel (para 3-29 b and c).

### 5-21. Condenser Fan Assembly

a. *Removal.* Refer to figure 5-3 and remove the condenser motor fan assembly.

b. *Installation.* Refer to figure 5-3 and install the condenser motor fan assembly by performing steps in reverse order.

### 5-22. Evaporator Blower

#### a. Removal.

- (1) Remove evaporator blower left-side access panel assembly (para 3-24 a).
- (2) Refer to figure 5-4 and remove the evaporator blower motor.

#### b. Installation.

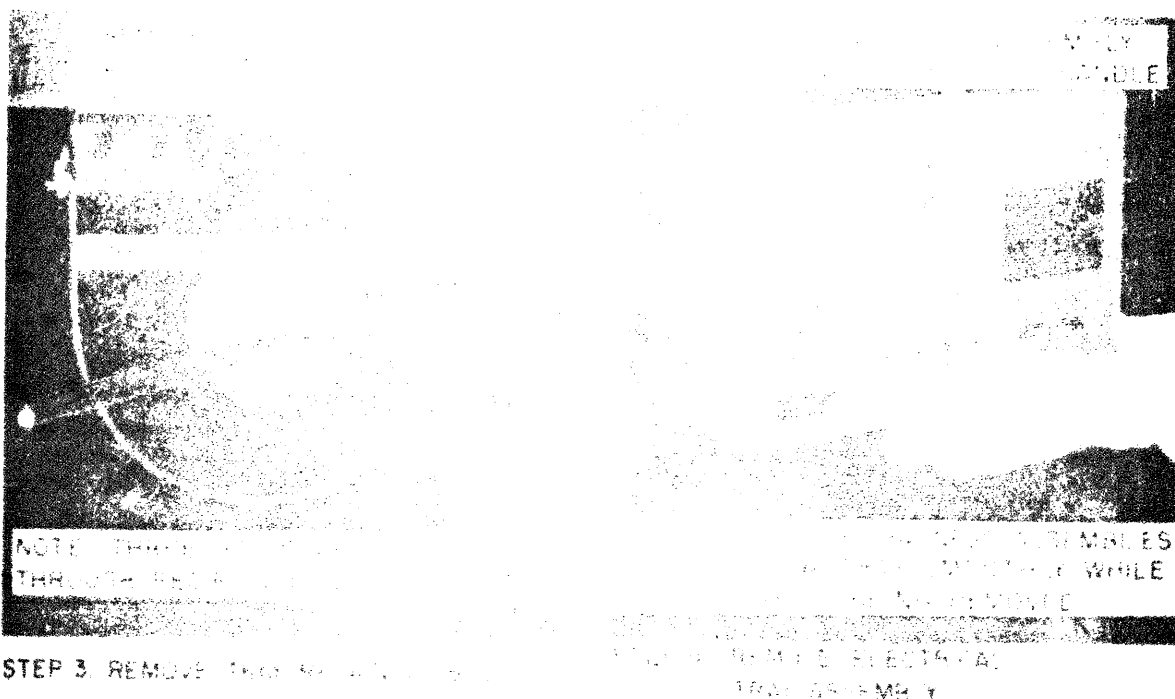
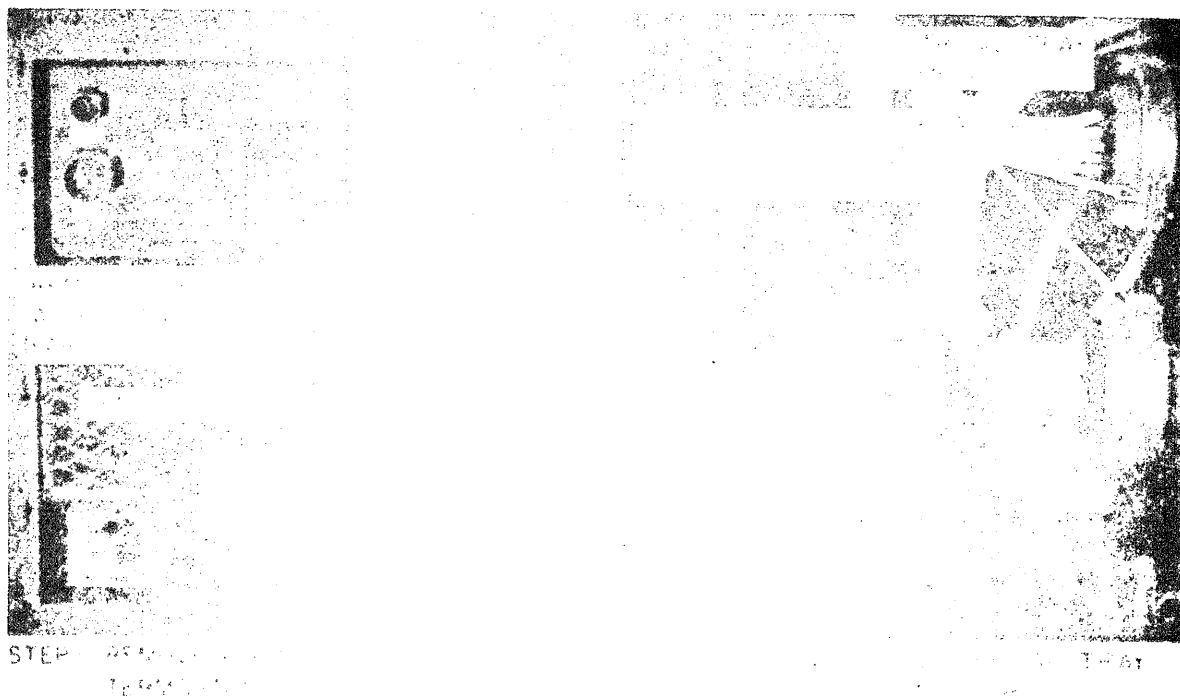
- (1) Refer to figure 5-4 and install evaporator blower by performing steps in reverse order.
- (2) Install evaporator blower left-side access panel assembly (para 3-24 b and c).

### 5-23. Evaporator Blower Motor

#### a. Removal.

(1) Refer to figure 5-5 and remove evaporator blower motor.

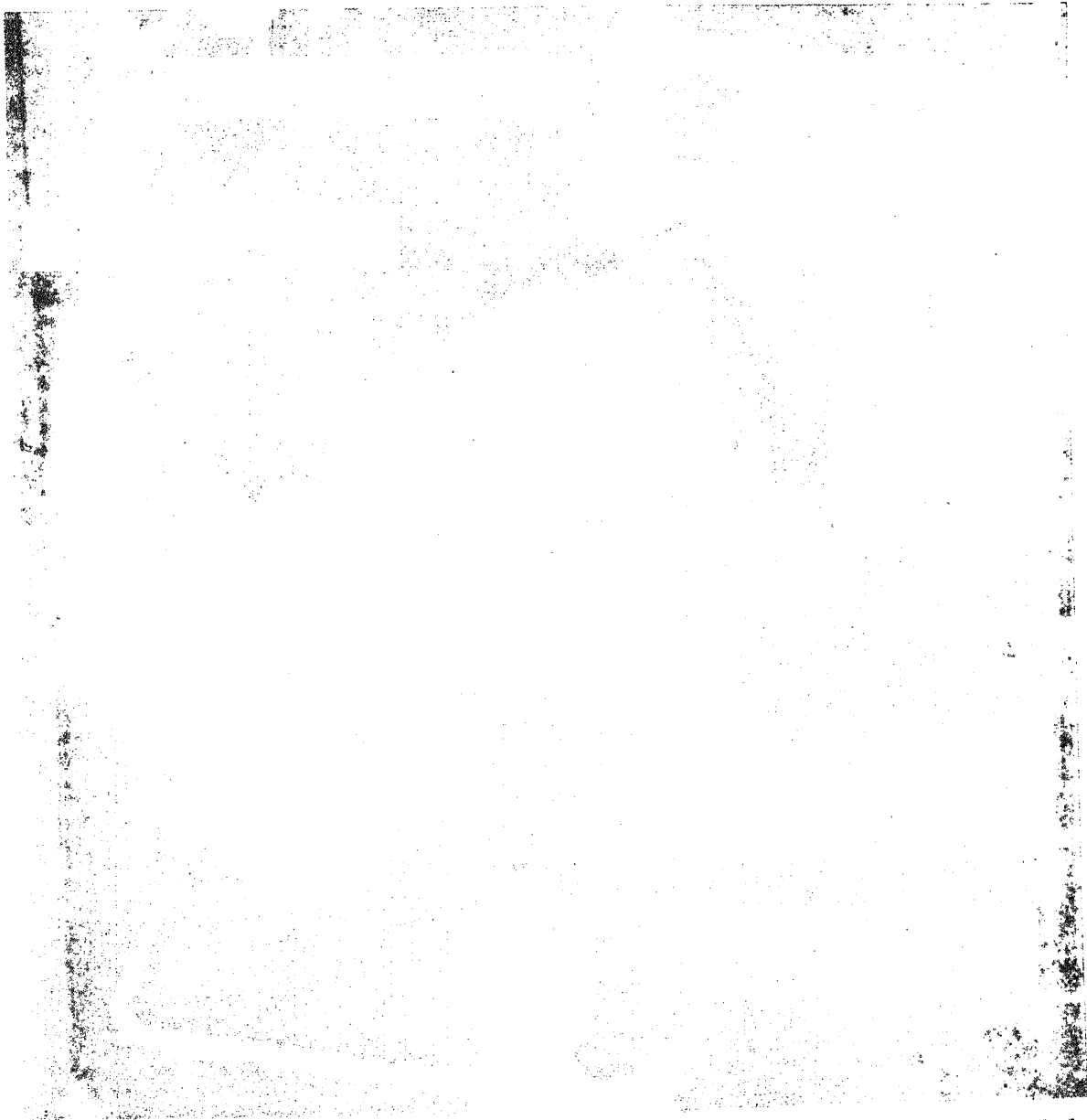
b. *Installation.* Refer to figure 5-5 and install evaporator blower motor by performing steps in reverse order.



ME 4120-287-15/5-1

Figure 5-1. Electrical tray assembly removal and installation.





ME 4120-287-15/5-2

*Figure 5-2. Motor compressor assembly removal and installation.*

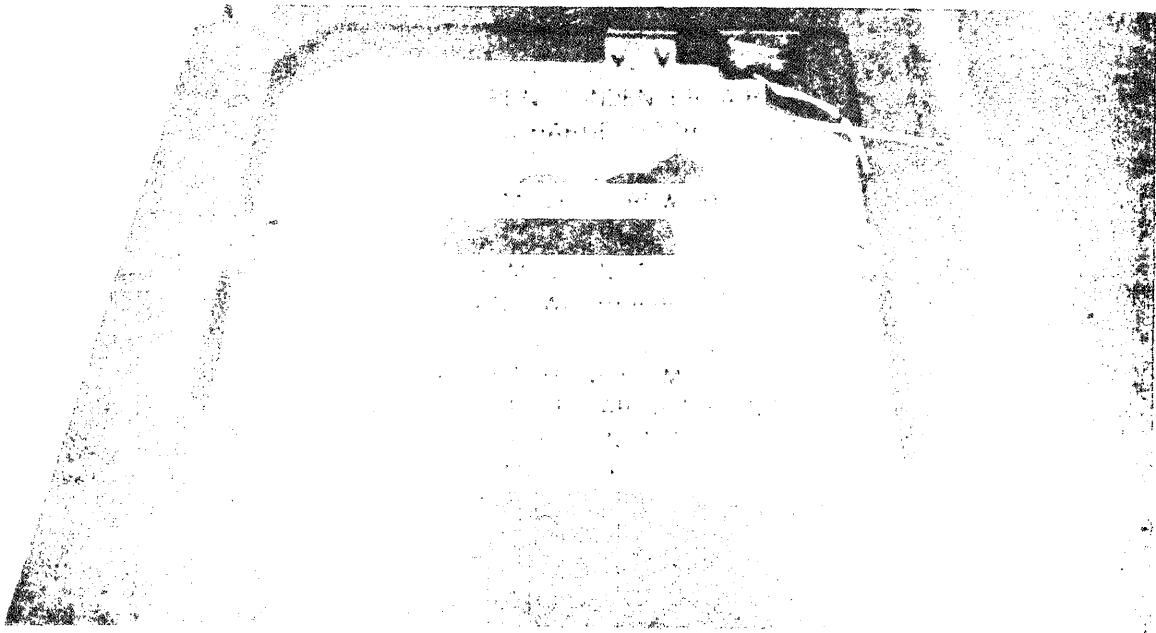
## **5-24. Condenser-subcooler Assembly**

### *a. Removal.*

(1) Remove air conditioner right-side access panel (para 3-29 a).

(2) Discharge refrigerant system (para 7-7).

(3) Refer to figure 3-4 and remove condenser air inlet filter.



STEP 1. REM. CONDENSER FAN ASSEMBLY



1. DISCONNECT CONDENSER FAN FROM ELECTRICAL SUPPLY

2. REMOVE BOLT AND WASHER

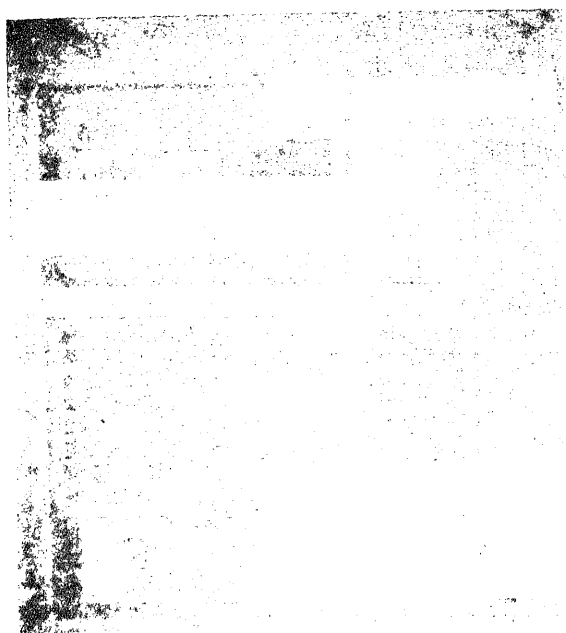
3. LIFT CONDENSER FAN ASSEMBLY OUT OF CABINET THROUGH CONDENSER AIR DISCHARGE PORT

NOTE: IT IS NOT NECESSARY TO REMOVE THE CONDENSER DISCHARGE DUCT

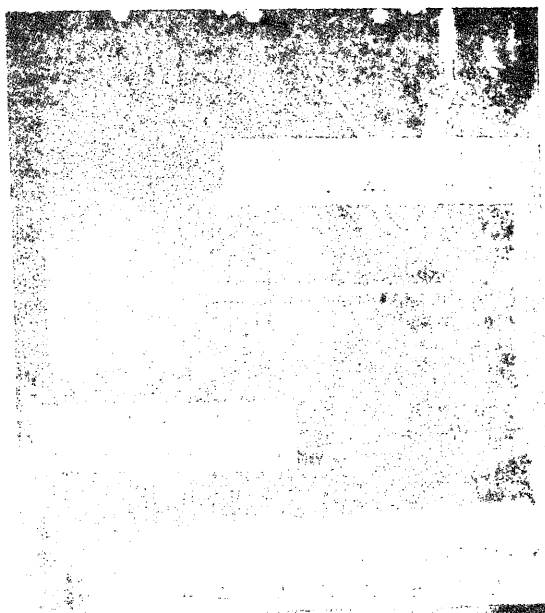
STEP 2. REMOVE CONDENSER FAN ASSEMBLY

ME 4120-287-15/5-3

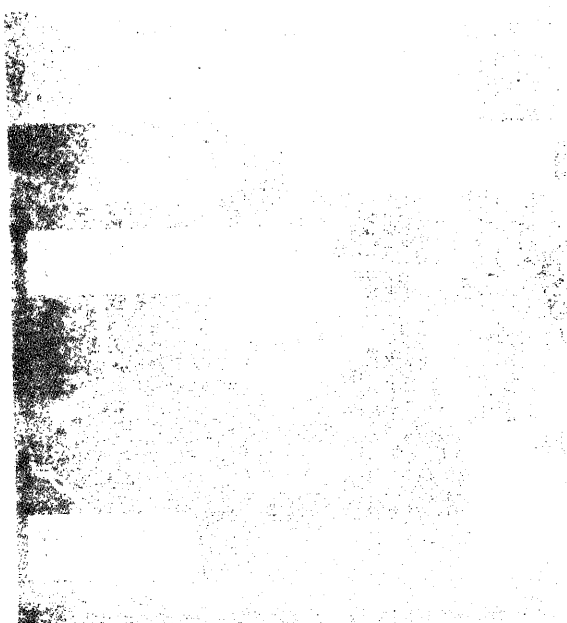
Figure 5-3. Condenser fan assembly removal and installation.



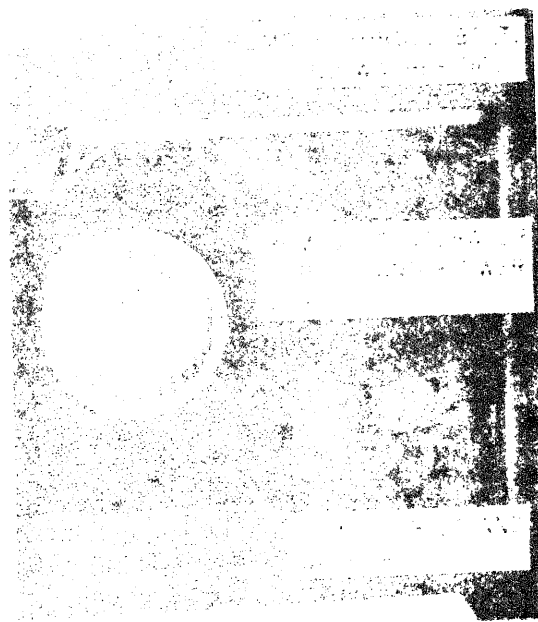
STEP 1. REMOVE SCREW FROM EVAPORATOR BLOWER ASSEMBLY



STEP 2. REMOVE SCREW FROM EVAPORATOR BLOWER ASSEMBLY



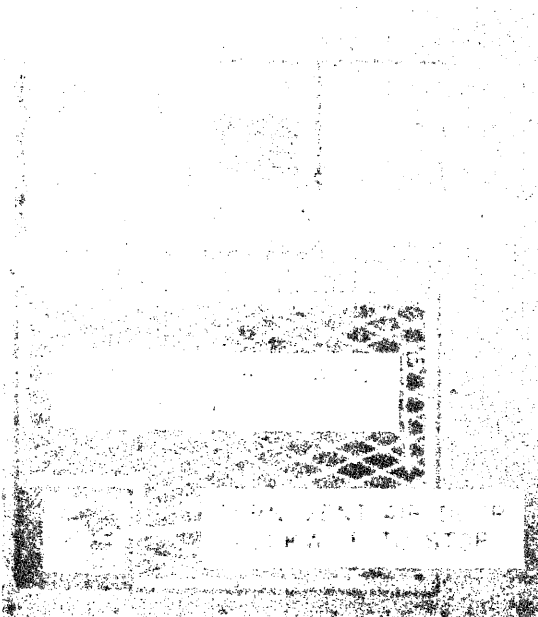
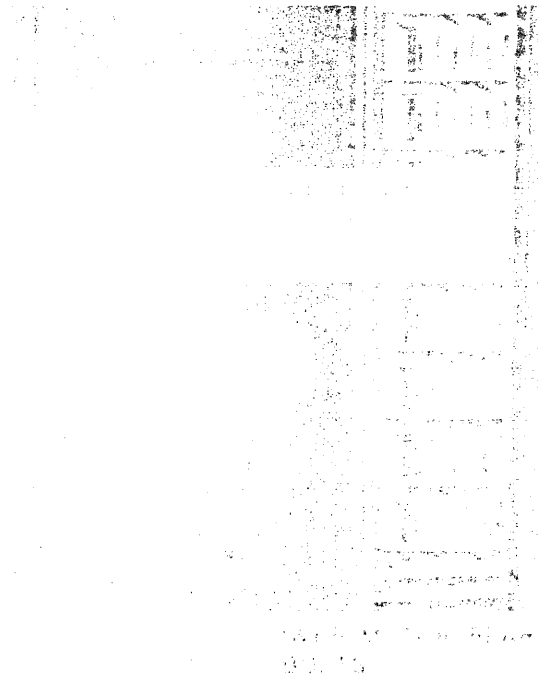
STEP 3. REMOVE SCREW FROM EVAPORATOR BLOWER ASSEMBLY



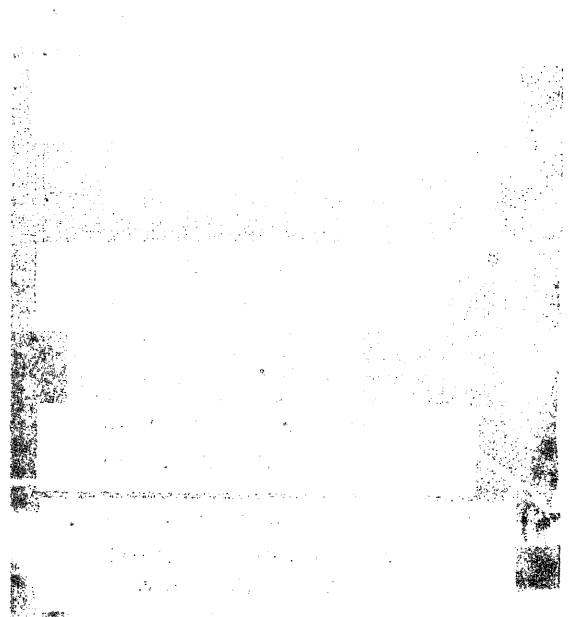
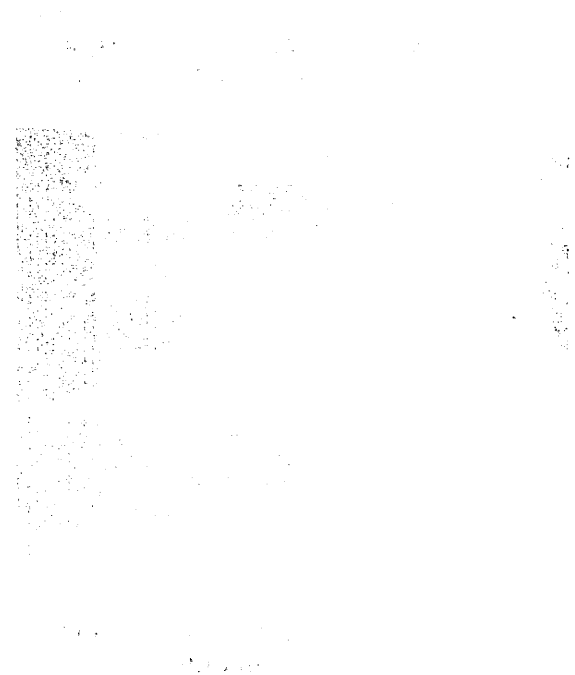
STEP 4. REMOVE BLOWER ASSEMBLY

ME 4120-287-15/5-4

Figure 5-4. Evaporator blower removal and installation.



STEP 3 REMOVE RECIRCULATING AIR SCREEN AND OPEN RECIRCULATING AIR DOOR



STEP 4 REMOVE EVAPORATOR BLOWER MOTOR

ME 4120-287-15

Figure 5-5. Evaporator blow motor removal and installation.

(4) Refer to figure 5-6 and remove condenser assembly.

*b. Installation.*

(1) Refer to figure 5-6 and install condenser assembly by performing steps in reverse order.

(2) Charge the refrigerant system (para 7-8 and 7-9).

(3) Refer to figure 3-4 and install condenser air inlet filter.

(4) Install air conditioner right-side access panel assembly (para 3-29 *b* and *c*).

## 5-25. Heater Assemblies

*a. Removal.* Refer to figure 5-7 and remove heater assemblies.

*b. Installation.* Refer to figure 5-7 and install heaters by performing steps in reverse order.

## 5-26. Mist Eliminator Assemblies

*a. Removal.*

(1) Remove heater assemblies (para 5-25 *a*).

(2) Refer to figure 5-8 and remove mist eliminator assemblies.

*b. Installation.*

(1) Refer to figure 5-8 and install mist eliminator by performing steps in reverse order.

(2) Install heater assemblies and conditioned air outlet screen (para 5-25 *b*).

## 5-27. Evaporator Assembly

*a. Removal.*

(1) Discharge and purge the refrigerant system (para 7-7 and 7-8).

(2) Remove evaporator air inlet filter (para 3-32 *a*).

(3) Remove mist eliminator (para 5-26 *a*).

(4) Remove electrical tray assembly (para 5-19 *a*).

(5) Remove the four evaporator assembly base retaining bolts, located at the rear top wall of the electrical tray recessed cabinet chamber.

(6) Refer to figure 5-9 and remove the evaporator assembly.

*b. Installation.*

(1) Refer to figure 5-9 and install evaporator assembly by performing steps in reverse order.

(2) Install the four evaporator assembly base retaining bolts through the electrical tray recessed cabinet chamber.

(3) Install electrical tray assembly (para 5-19 *b*).

(4) Install mist eliminator (para 5-26 *b*).

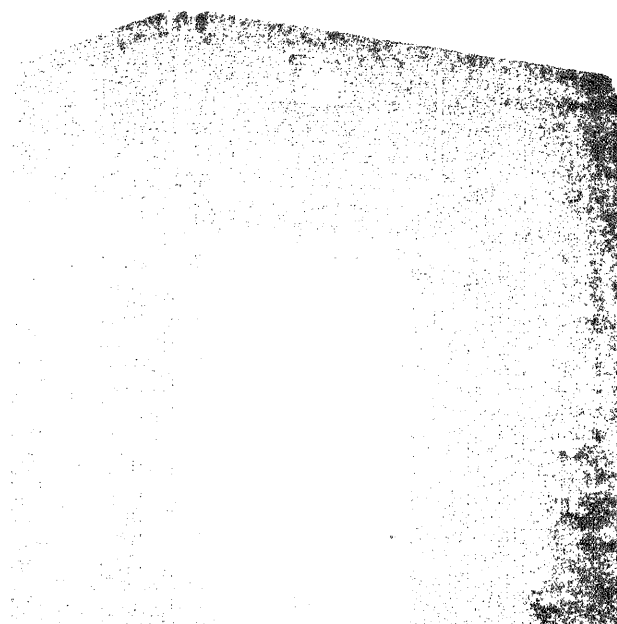
(5) Install evaporator air inlet filter (para 3-32 *a*).

(6) Charge the refrigerant system (para 7-9).

## 5-28. Refrigerant System Components

Refer to chapter 7 for removal and installation instructions of refrigerant system components.

1. ROLL AWAY THE TOP COVER  
AS SHOWN.



2. THE CONDENSER-SUBCOOLER ASSEMBLY IS REMOVED FROM THE UNIT.



STEP 2 REMOVE CONDENSER SUBCOOLER ASSEMBLY

UNBRAZE JOINT

NOTE: BRAZE AND UNBRAZE JOINTS  
IN A. ACCORDING WITH  
PARAGRAPH 2-14.

REMOVE REEL  
AND ASSEMBLY

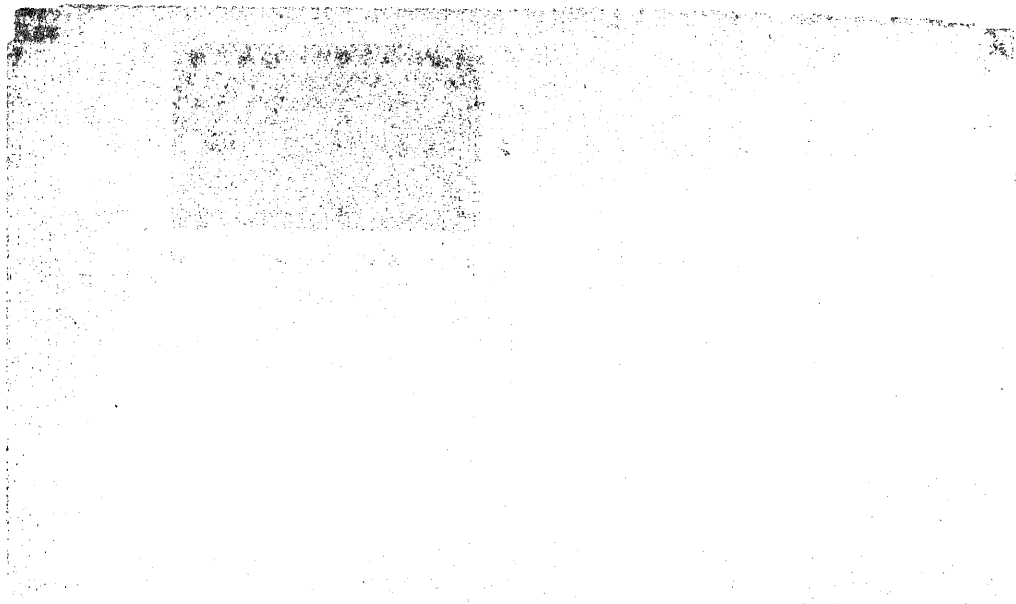
RECOILER

RECOILERS CAN BE LEFT  
IN PLACE BY UNBRAZING  
INDICATED JOINTS

UNBRAZE JOINT

ME 4120-287-15/5-6

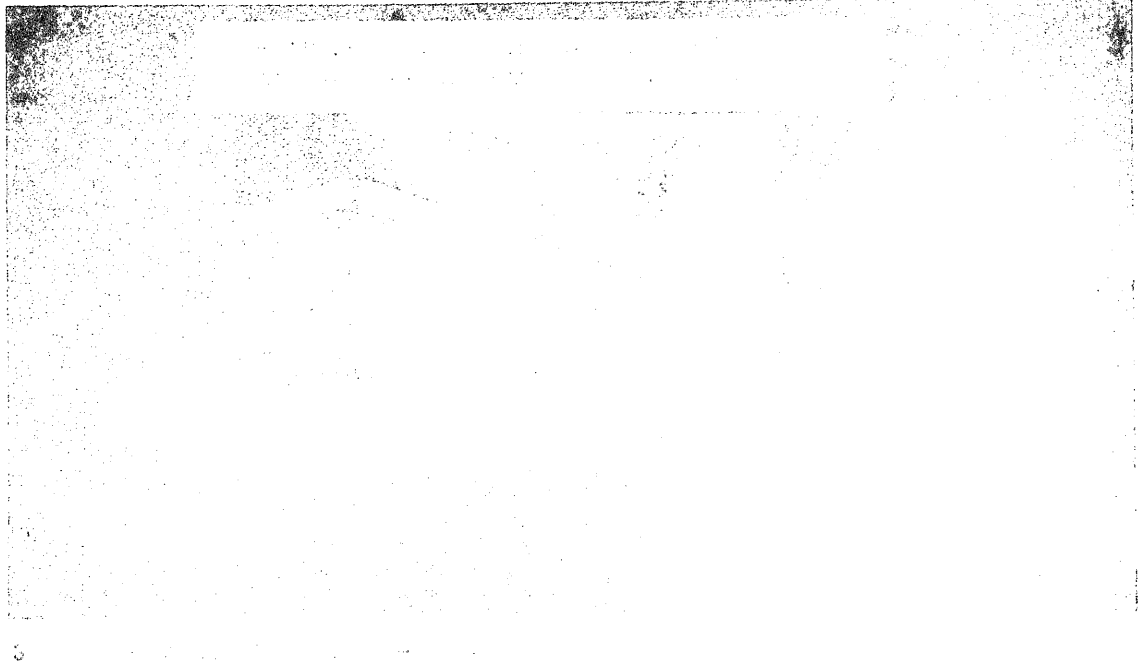
Figure 5-6. Condenser-subcooler assembly removal and installation.



STEP 3 REMOVE HEATER ASSEMBLY

4-20 287-5/5-1

*Figure 5-7. Heater assemblies removal and installation.*

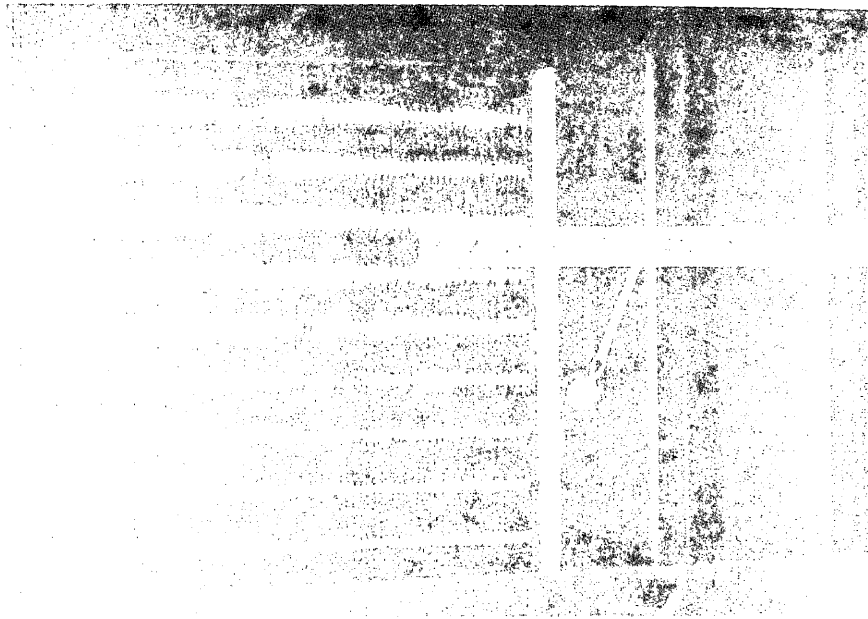


STEP 2 REMOVE MIST ELIMINATOR

ME 4120-287-15/5-8

*Figure 5-8. Mist eliminator removal and installation.*





REMOVE EVAPORATOR MOUNTING BOLT



STEP 1. REMOVE REFRIGERATION PIPING

REMOVE EVAPORATOR BOLT  
AND LEFT-SIDE AIR FILTER  
PARAGRAPHS 3-22, 3-23, 3-24

LOOSEN BOLT 2  
AND REMOVE EVAPORATOR  
AIR FILTER FILTER

UNRAZE JOINT AND BOLT  
WITH PARAGRAPHS 7-14, 7-15  
AND 7-16

THERMISTATE EXPANDER VALVE

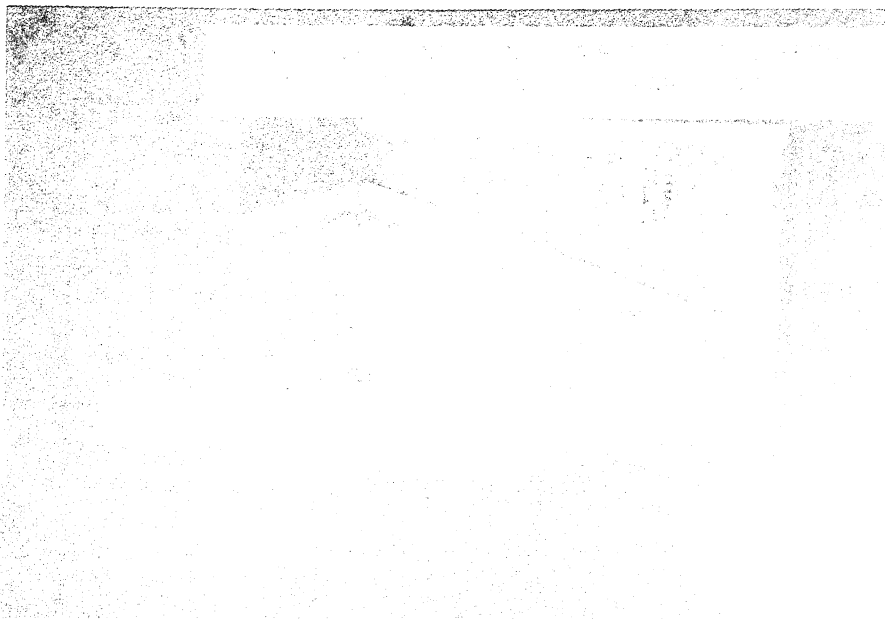
UNRAZE JOINT AND BOLT 7-14

REMOVE EVAPORATOR  
ASSEMBLY BEING CAREFUL  
NOT TO DAMAGE PINS

ME 4120-287-15/5-9

Figure 5-9. Evaporator assembly removal and installation.

TM 5-4120-287-15



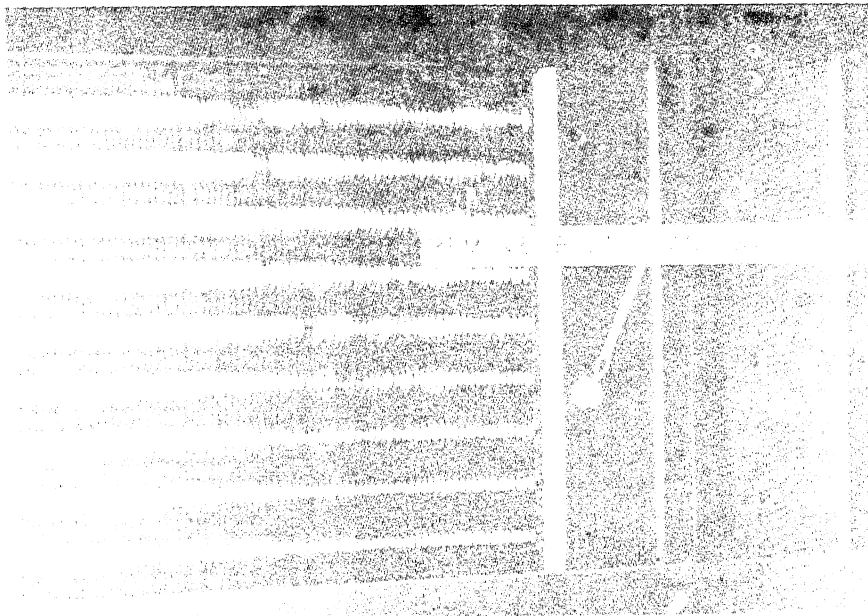
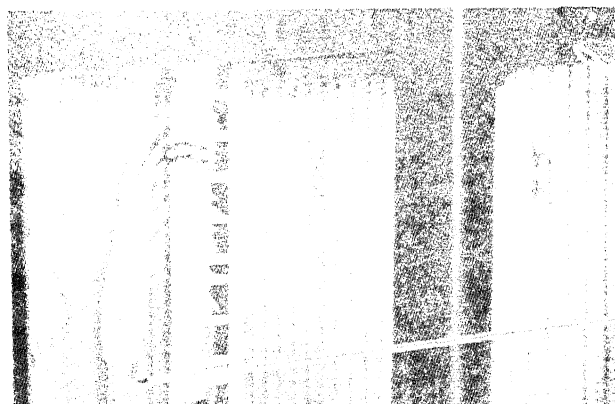


FIG. 1. AIR INLET ASSEMBLY MOUNTING BOLT



REMOVE BUSHING  
AND LEFT SIDE  
PARAGRAPH 2

LOOSEN BOLT 2  
AND REMOVE AIR  
AIR INLET PLATE

UNRAISE BOLT  
WITH PARAGRAPH  
AND 7-6

# CHAPTER 6

## ELECTRICAL SYSTEM REPAIR INSTRUCTIONS

### Section I. REMOTE CONTROL BOX ASSEMBLY

#### 6-1. General

The remote control box assembly (figs. 2-2 and 6-1) consists of a 5-gang, 4-position selector switch (air conditioning switch) and a 5000-ohm variable resistor (temperature control), as described in paragraph 2-8 a.

#### 6-2. Removal

a. Set master circuit breaker to OFF position.

b. Remove remote control wiring harness plugs P102 and P103 from electrical tray remote control receptacle J102 and remote control box assembly receptacle J103, respectively.

c. Remove remote control box assembly from mounting site (para 3-38 a).

#### 6-3. Testing

Using a multimeter set to read 10,000-ohms resistance, test the remote control box as follows:

a. *Temperature Control Variable Resistor.* When testing the temperature Control Variable Resistor perform the following:

(1) Turn temperature control knob to

b. *Air Conditioning Switch.* Turn the air conditioning switch to the following:

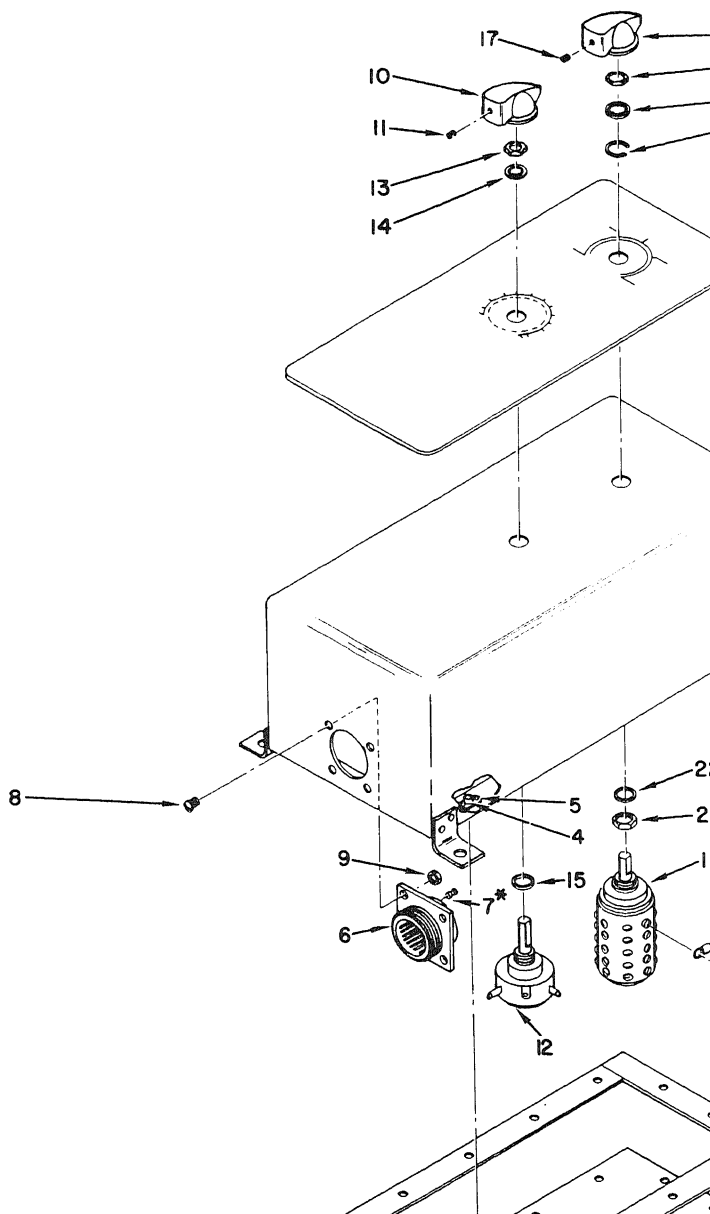
(1) Turn temperature control knob to COOL position.

(2) With multimeter set to resistance, connect to remote control box assembly receptacle J103 terminal sets listed in table 6-1. Check air conditioning switch to VENT, and COOL position. Results listed in table 6-1.

Table 6-1. Air Conditioning Switch

Multimeter test leads at J103 terminal sets	Air conditioning switch	
	Warm	Off
A-E	0	0
A-F	C	0
B-D	C	0
B-H	V	V
C-J	0	0
C-L	C	0
D-H	V	0
D-K	C	0

0—Multimeter indicates open circuit between terminals.  
C—Multimeter indicates continuity between terminals.  
V—Multimeter indicates continuity between terminals.  
temperature control dial is in COOL position.  
ohms resistance when temperature control knob is in COOL position.



1 Cover	11 Screw	21 Locking ring w
2 Gasket	12 Rheostat, 5000 ohms (R3)	22 Bushing seal
3 Screw (14)	13 Nut	23 Nut
4 Plate nut (14)	14 Locking ring washer	24 Screw
5 Rivet (28)	15 Mounting seal	25 Washer
6 Electrical connector (J103)	16 Knob	26 Terminal lug
7 Nylon plug (6)	17 Screw	27 Switch identifi
8 Screw (4)	18 Switch (S2)	28 Box
9 Nut (4)	19 Nut	
10 Knob	20 Lockwasher	

Figure 6-1—Continued.

### b. Repair and Inspection.

(1) Using a light stream of clean, dry compressed air remove all dirt and dust from remote control box.

(2) Replace defective parts with new parts.

(3) Recheck remote control box in accordance with paragraph 6-3.

c. Reassembly. Reassemble remote control box assembly in reverse of number of parts as illustrated in figure 6-1.

## Section II. SENSING SWITCHES AND SOLENOID VALVE COIL

### 6-5. General

*Note.* Disconnect air conditioner from power source before performing any maintenance or inspection of electrical system, other than operation tests. The operating voltage of this air conditioner is dangerous; severe, possibly fatal shock may result from coming in contact with any part of the electrical system.

The sensing switches and solenoid valve are located throughout the air conditioner unit as shown in figure 6-2. The sensing switches and solenoid valve control the operating parameters and operation of the air conditioner. The following are discussed:

a. Condenser fan discharge door micro switch, S101.

b. Low ambient switch, S102.

c. High-low pressure switch, S103.

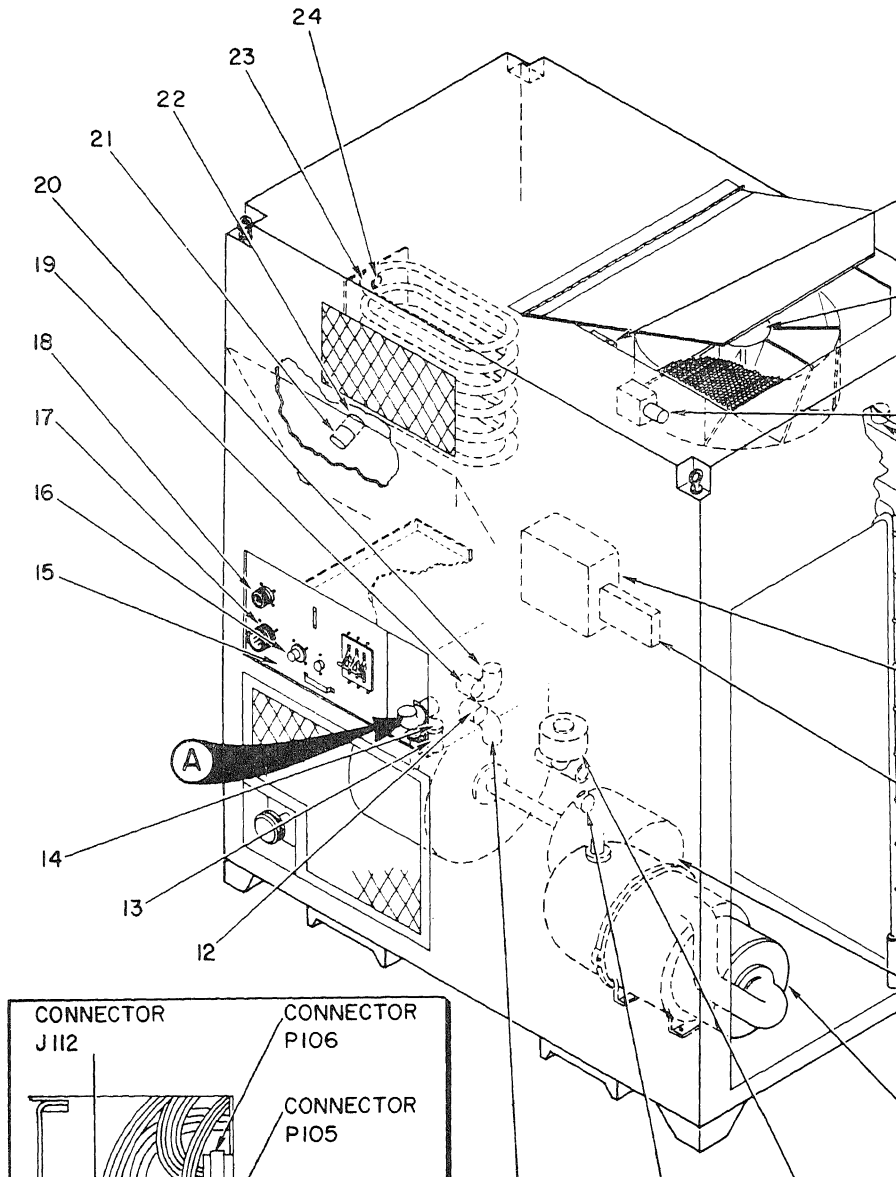
(2) Open the condenser fan discharge door and check for continuity between terminals M and L.

(3) Depress the microswitch and check for an open circuit between terminals M and L.

(4) If the condenser fan discharge door switch does not make and break contact in a (2) and (3) of this paragraph, the switch is defective and must be replaced.

(5) Repeat step a (3) of this paragraph by closing the condenser fan discharge door microswitch. If the microswitch does not make contact when depressed by the door, the switch is defective and must be replaced.

b. Low Ambient Switch (S102). Connect a multimeter check low ambient



CONNECTOR  
J112

CONNECTOR  
P106

CONNECTOR  
P105

Microswitch S101  
 Condenser fan motor B101  
 Voltage conversion connector P111  
 Low ambient switch S102  
 High-low pressure switch S103  
 Terminal board TB-1  
 Vaporator blower motor B102  
 Compressor motor B103  
 Solenoid valve coil L101  
 Voltage conversion connector P110  
 Electrical connector plug P111  
 Thru-bulkhead electrical connector J105-J113

13 Electrical connector plug P109  
 14 Thru-bulkhead electrical connector J107-J  
 15 Electrical tray assembly  
 16 Fuse holder and fuse F1  
 17 Electrical connector jack J101  
 18 Electrical connector jack J102  
 19 Thru-bulkhead electrical connector J106-J  
 20 Electrical connector plug P108  
 21 Electrical connector plug P104  
 22 Electrical connection jack J104  
 23 Heater bank (2)  
 24 Heater temperature switch S104

Figure 6-2—Continued.

5) Reconnect wires 109 and 111 to terminal board TB1.

*High-low Pressure Switch (S103).* Trace leads 110 and 112 from Terminal board TB1; and check for continuity. If continuity exists replace switch. There is no logical method for checking high-low pressure switch operation in the air conditioner operating conditions. It is recommended that a suspected faulty high-low pressure switch be replaced.

*Heater Temperature Switch (S104).* Using a multimeter, check heater temperature switch S104 as follows:

- (1) Remove power input plug.
- (2) Connect the multimeter test leads between J112-B and J112-D terminals.
- (3) Check to determine that heater temperature switch is closed.
- (4) Disconnect P107 from J107.
- (5) Place a thermometer thru conditioned air outlet screen so that thermometer is near heater temperature switch.
- (6) Connect power supply plug to Input receptacle J101.
- (7) Start air conditioner. Set air condi-

*e. Thermostat (S105).* Using a multimeter, check thermostat S105 as follows:

(1) Remove thermostat S105 (3-39) leaving thermostat leads attached to terminal board TB1.

(2) Connect multimeter test leads between terminal board TB2 contacts 1 and 2.

(3) Run air conditioner with air conditioning switch in HEAT position and temperature control switch set to maximum position.

(4) Set thermostat bulb in water bath at a temperature of  $40 \pm 5^\circ\text{F}$ . Determine that heaters are operating and that multimeter indicates continuity between TB2 contacts 1 and 3.

(5) Set thermostat bulb in water bath at a temperature of  $105 \pm 10^\circ\text{F}$ ; then set temperature control switch to maximum position. Determine that heaters are operating and that multimeter indicates an open circuit between TB2 contacts 1 and 3.

(6) Set the air conditioning switch in COOL position.



(10) If thermostat does not meet criteria established in e (4), (5) and (8) of this paragraph, it is defective and must be replaced.

*f. Solenoid Valve Coil L101.* Test solenoid valve coil as follows:

(1) With air conditioner running in COOL mode and Temperature control switch set to maximum warm, place thermostat S105 in water having a temperature of  $40 \pm 5^\circ\text{F}$ .

(2) Disconnect from terminal Board.

(3) Apply 28VDC to coil leads and through refrigerator. Remove 28VDC supply and refrigerant flow ceases.

(4) Replace coil with a new part.

### Section III. ELECTRICAL TRAY ASSEMBLY

#### 6-7. General

The electrical tray assembly consists of the following items (figs. 2-3 and 6-3): Master circuit breaker, CB1; 28-volt, 3/4 amp fuse holder, F1; system reset switch, S1; elapsed time hourmeter, M1; power transformer, T1; silicon rectifier, CR1; control relays and line contactor relays, K101 thru K108; and associated wiring harness assemblies.

#### 6-8. Removal

Remove electrical tray assembly (para 5-19).

#### 6-9. Testing

**Warning:** Make sure master circuit breaker is set to OFF position and power supply is disconnected from POWER INPUT receptacle J101 when preparing for tests and connecting test leads.

##### *a. Master Circuit Breaker (CB1).*

(1) Check power supply "hot" leads for 240-vac volts alternating current potential to ground.

(a) Check voltage (para 3-37).

(b) Replace fuse holder.

(2) Phase sequence

(a) Using a voltmeter across relay K101.

(b) If read phase sequence relay must be replaced.

(3) Power Transformer

(a) Shunt 25-ohm resistor across terminals 7 with a 25-ohm resistor.

(b) Using a voltmeter across terminals 30.2  $\pm$  1 across transformer.

(c) Remove resistor.

(d) Shunt 25-ohm resistor across terminals 6 with a 25-ohm resistor.

(e) Using a voltmeter across terminals 30.2  $\pm$  1 vac across transformer and 6.

(f) Remove resistor.

(a) If read

c. *Control Relays.* The control relays are as follows: trip relays K101; time delay relay K102; temperature control relay K103; and line contactor relays K104, K105, K106 and K107.

**Warning:** Set master circuit breaker to OFF position and disconnect power supply from power input receptacle (J101) when testing the relays.

(1) *Trip Relay (K101).*

(a) Connect the positive side of a 28 vdc power supply to rectifier (CR1) terminal C; and connect the negative side to transformer (T1) terminal 6.

(b) Press system reset switch.

(c) Using a multimeter, check for continuity across K101 terminals 5 and 3, and 2 and 11.

(d) If terminal 5 and 3, and 2 and 11, are open, trip relay K101 is defective and must be replaced.

(e) Using a jumper, momentarily connect K101 terminal 7 and 1; then remove jumper.

(f) Check K101 terminals 5 and 3, and 2 and 11 for an open circuit.

(g) If terminals 5 and 3, and/or 2 and 11 exhibit continuity, trip relay K101 is defective and must be replaced.

(h) Press system reset switch. Terminals 5 and 3, and 2 and 11 should now exhibit continuity; if not, either trip relay K101 or system reset switch S1 is defective and must be replaced.

(i) Set master circuit breaker to OFF position.

(j) Connect to K101 terminals 1 and 7, and test for continuity.

(c) Observe that have elapsed and before elapsed, multimeter reads 2.

(d) If multimeter maintained within specified time delay K102 is defective and

(3) *Temperature control*

(a) Check K103 and 1 and 6 for continuity.

(b) If continuity in relay K103 is defective and

(c) Check for an open K103 terminals 3 and 5.

(d) If K103 terminal continuity, relay K103 is to be replaced.

(e) Check for a short across K103 terminals 1 and

(f) If K103 terminal continuity either relay K103 is defective and must be replaced.

1. Check capacitor condition.

2. Replace capacitor (shorted).

3. Replace relay C2 is not shorted.

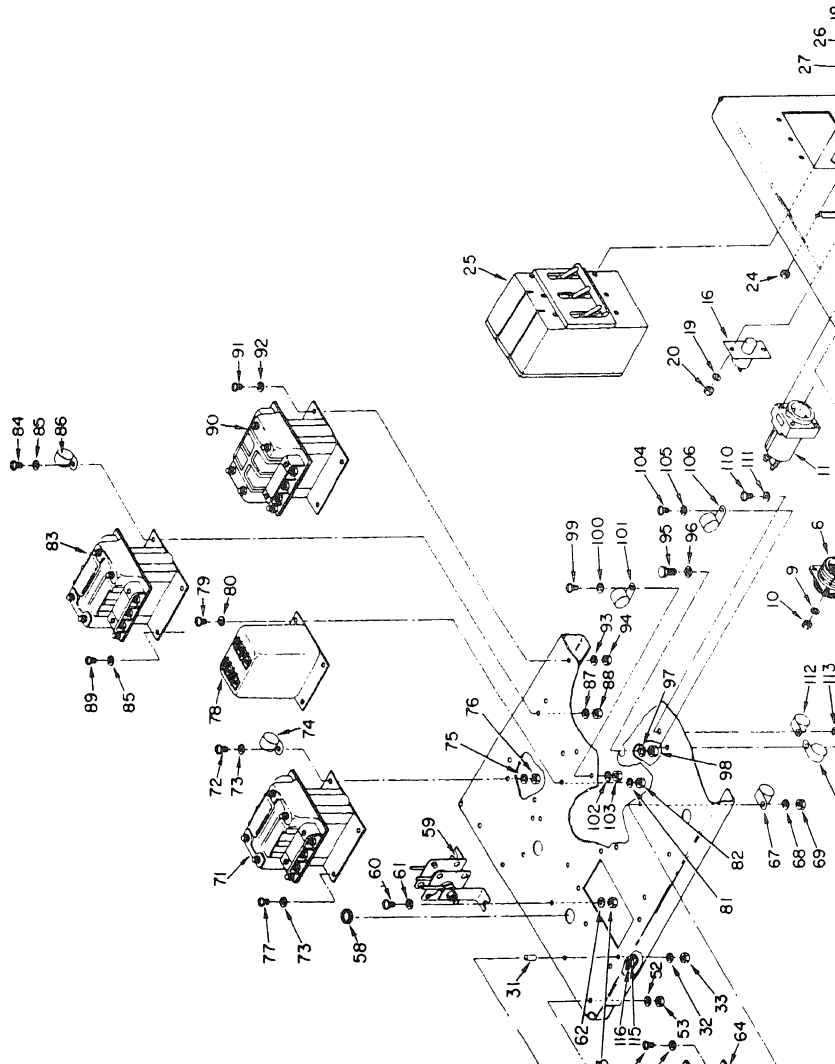
(g) Disconnect jumper from K103 terminal 8; check across relay K103 terminals

(h) Check that K103 3 and 1 and 7 exhibit continuity.

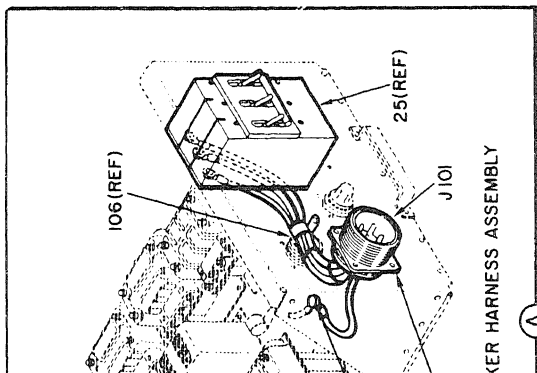
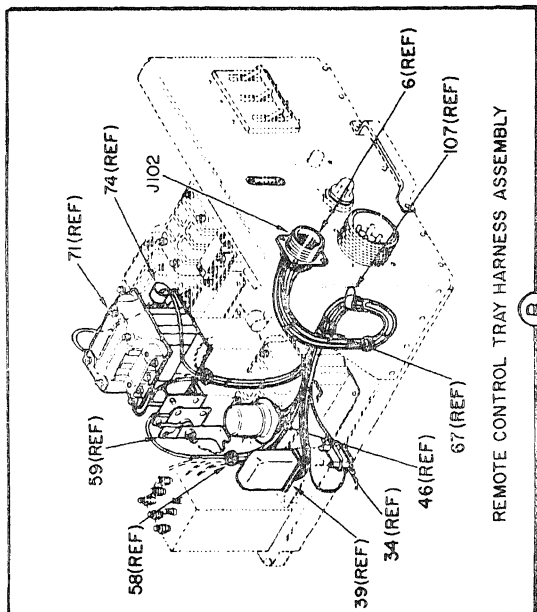
(i) If continuity in relay K103 is defective and

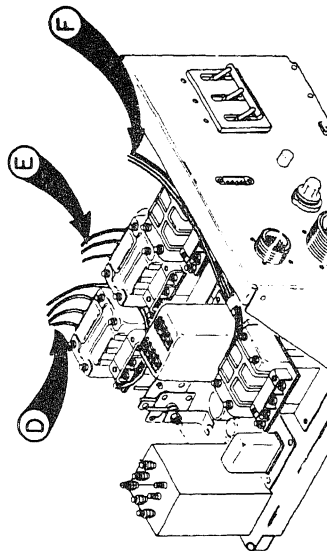
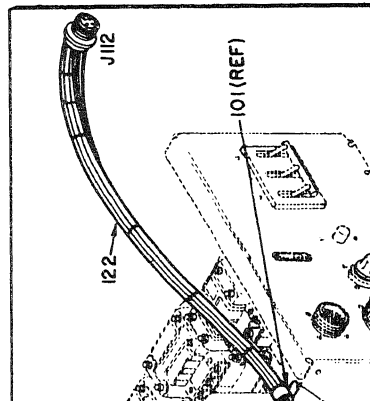
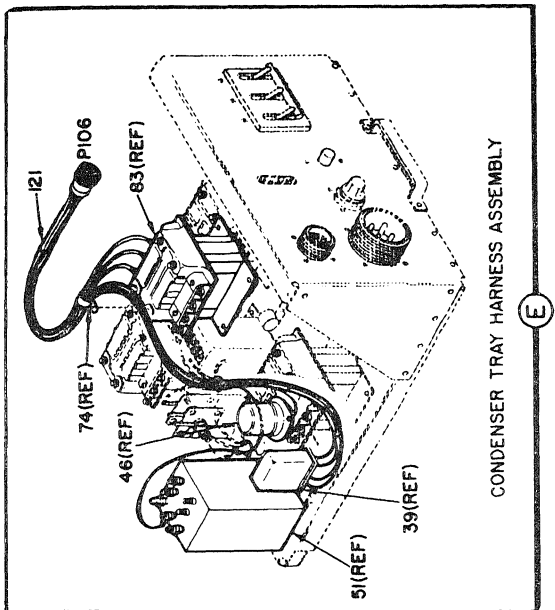
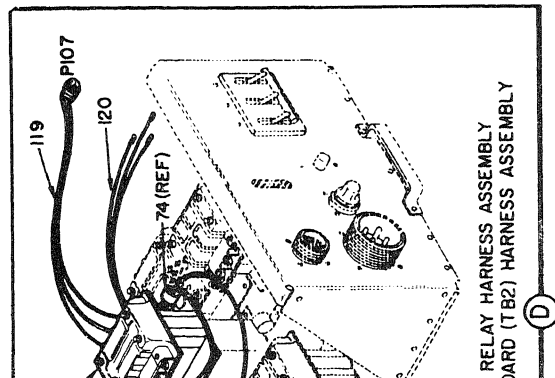
(j) Check for an open K103 terminals 2 and 5.

(k) If relay K103 does not exhibit continuity, relay K103 must be replaced.



42	Time delay relay (K102)	83	Condenser fan motor relay (K105)
43	Screw (2)	84	Screw
44	Lock washer (2)	85	Lock washer (4)
45	Nut (2)	86	Clamp
46	Temperature control relay (K108)	87	Flat washer (4)
47	Cycling capacitor (3)	88	Nut (4)
48	Screw (2)	89	Screw (3)
49	Lock washer (2)	90	Compressor motor relay (K104)
50	Nut (2)	91	Screw (4)
51	Power transformer, low voltage supply (T1)	92	Lock washer (4)
52	Lock washer (4)	93	Flat washer (4)
53	Nut (4)	94	Nut (4)
54	Nut (14)	95	Bolt
55	Lock washer (7)	96	Flat washer
56	Flat washer (14)	97	Lock washer
57	Jumper (shorting link) (2)	98	Nut
58	Grommet (4)	99	Screw
59	Rectifier	100	Lock washer
60	Screw (2)	101	Clamp
61	Flat washer (2)	102	Flat washer
62	Lock washer (2)	103	Nut
63	Nut (2)	104	Screw
64	Heater relay (K107)	105	Lock washer
65	Screw (2)	106	Clamp
66	Lock washer (4)	107	Clamp
67	Clamp (2)	108	Flat washer
68	Flat washer (4)	109	Nut
69	Nut (4)	110	Screw
70	Screw (2)	111	Lock washer
71	Evaporator fan motor relay (K106)	112	Clamp
72	Screw	113	Flat washer
73	Lock washer (4)	114	Nut
74	Clamp	115	Plate nut (6)
75	Flat washer (4)	116	Blind rivet (12)
76	Nut (4)	117	Tray assembly
77	Screw (3)	118	Compressor relay harness assy
78	Phase sequence relay (K108)	119	Evaporator relay harness assy
79	Screw (4)	120	Terminal board (TB2) harness assembly
80	Lock washer (4)	121	Condenser harness assembly
81	Lock washer (4)	122	Heater cable harness assembly





(n) Remove 28 vdc power supply from K103 terminals 4 and 8; then replace jumper J (fig. 1-9).

(4) *Line contactor relays* (K104, K105, K106 and K107).

*Note.* The operation of the four line contactor relays are identical; therefore one set of instructions are given to cover all line contactor relays.

(a) Remove 28 vdc power supply leads from rectifier (CR1) terminal C and transformer (T1) terminal 6.

(b) Check for an open condition across relay terminals A1 and A2, B1 and B2, and C1 and C2.

(c) If continuity is exhibited across any one of the three terminal sets, the relay is defective and must be replaced.

(d) Apply 28 vdc across relay terminals 1 and 2.

(e) Check for continuity across relay terminals A1 and A2, B1 and B2, and C1 and C2.

(f) If con  
any one of the t  
defective and mu

## 6-10. Electrical

a. *Disassembly*  
assembly in num  
in figure 6-3. R  
quired to replace

b. *Repair and*

(1) Using a  
compressed air m  
electrical tray as

(2) Replace  
parts.

(3) Check m  
bly component in  
6-9.

c. *Reassembly*  
assembly in reve  
illustrated in fig

## Section IV. MOTORS AND HEATER ASSEMBLY

### 6-11. General

The motors and heater assembly operate at line voltage. Remove and test only the suspected faulty component.

### 6-12. Removal

a. Remove evaporator motor (para 5-23 a).

b. Remove condenser fan motor assembly (para 5-21 a).

c. Remove motor compressor assembly (para 5-20 a).

d. Remove heater assembly (para 5-25 a).

a. Place the m  
tested on a work

b. Apply work  
or heater assemb

c. If the motor  
function, it must

### 6-14. Replacement

a. Replace eva

b. Replace con

## CHAPTER 7

### REFRIGERANT SYSTEM REPAIR INSTRUCTIONS

#### Section I. CHARGING THE REFRIGERANT SYSTEM

##### General

This section describes the methods used to charge, discharge and add oil to the refrigerant system; and to check the system for refrigerant leakage.

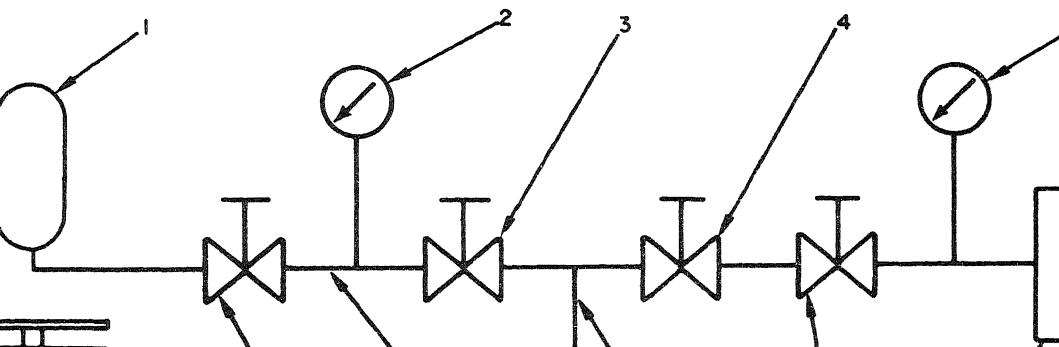
Make sure the refrigerant charging apparatus (fig. 7-1) is clean and in operational condition.

When adding oil use a clean, moisture-free oil container. Cap oil container immediately after use to eliminate moisture contamination of the oil.

##### 7-2. Precautions When Handling Refrigerant

Although refrigerant-12 is one of the safer refrigerants to handle, it is important that personnel observe the following precautions when handling the refrigerant.

a. Do not discharge refrigerant in areas having exposed flames. A heavy concentration of refrigerant in contact with an open flame produces a gas which is toxic and attacks bright metal surfaces.





b. Do not expose the eyes to the refrigerant. If refrigerant-12 comes in contact with eyes, observe the following instructions.

- (1) Do not rub the eye(s).
- (2) Arrange at once to take the effected person to an eye specialist.

(3) Put drops of sterile mineral oil into the eyes to remove the excess refrigerant.

(4) Wash the eyes with either a weak solution of boric acid or a sterile salt solution (not to exceed 2 percent sodium chloride).

c. Do not expose the skin to the liquid refrigerant. If the liquid comes in contact with the skin treat the injury the same as though the skin has been frostbitten or frozen. If a person is overcome in an area which lacks oxygen because of the presence of a high concentration of refrigerant-12, treat the person by applying artificial respiration produced manually or by a pulmotor.

### 7-3. Refrigerant Service Cylinder Handling Procedures

The following precautions must be observed when handling refrigerant bottles.

a. Do not leave the refrigerant bottle uncapped. All refrigerant bottles are shipped with a metal screw cap to protect the valve and safety plug from damage. Replace the cap after each use of the refrigerant bottles.

b. Do not carry or otherwise transport a refrigerant bottle in the passenger compartment of a vehicle or carrier. Do not expose refrigerant bottle to radiant heat from the sun because the resulting increase in pressure can cause the safety plug to release or the bottle to burst.

c. Never subject the refrigerant bottle to

c (1)). If the refrigerant bottle shows additional refrigerant, the bottle will appear in the liquid phase.

b. Set Master Cylinder pressure to 100 psi.

### 7-5. Adding Refrigerant

a. Remove the cap from the panel access assembly.

b. Set up the refrigerant charging apparatus, (fig. 7-1) in the section.

c. Close the refrigerant control valve.

d. Connect the refrigerant-12 bottle to the apparatus.

**Warning:** Wear safety goggles when handling refrigerant cylinders.

e. Remove the air cap and connect the hose to the charge coupling on the high pressure charge valve.

f. Open the charge control valve to permit refrigerant to flow from the coupling to the system.

g. When the refrigerant is added, the air trapped in the hose, tighten the coupling and close the refrigerant control valve.

h. Unlock the safety plug on the refrigerant-12 bottle.

i. Open the air cap.

**Note.** The maximum pressure in the bottle shall not exceed 150 psi.

the liquid sight glass have been eliminated, close the refrigerant control valve. Observe the liquid refrigerant sight indicator for three to four minutes after flow clears to ascertain that sufficient refrigerant-12 has been added to the system.

**Caution:** Do not overcharge the refrigerant system. After each small quantity of refrigerant-12 has been added to the refrigerant system, allow three to four minutes for the refrigerant to circulate before adding more refrigerant. Do not attempt to meter the flow of refrigerant-12 with the air conditioner charge valve.

n. Set master circuit breaker to OFF position.

o. Note scale reading and add one additional pound of refrigerant-12 to refrigerant system.

p. Remove the air conditioner right-side access panel assembly.

q. Close air conditioner charge valve.

r. Close the refrigerant-12 bottle valve.

s. Disconnect the refrigerant supply hose from the refrigerant-12 bottle.

t. Disconnect the evacuation and charge hose from the air conditioner charge valve and cap the charge valve.

**Warning:** High pressure refrigerant is trapped in the charging line. Caution should be used in releasing this pressure.

u. Inspect the refrigerant system for leaks (para 7-6).

v. Install the air conditioner right-side access panel assembly (para 3-29 c).

(1) *Leak test.* Remove assemblies (para 3-23 a, 3)

**Warning:** Do not use in the presence of explosives. The area in which the be used must always be charged with an explosimeter. If the atmosphere in the compartment area causes any scale of the explosimeter area must be purged or explosive vapor before the leak is eliminated.

**Caution:** Do not use explosion probe to large leaks without the use of the leak detector to prevent damage to the leak detector.

(2) Pass the leak detector over refrigerant lines, fittings, joints and valves.

**Note.** To obtain good results use the leak detector in a draft, and use the leak detector probe to refrigerant lines for a period of time.

(3) Pass the leak detector over all accessible welded joints on the condenser and evaporator. Check the compressor housing for refrigerant liquid sight indicator.

(4) Mark all leaks after completion of leak test (para 7-6).

b. A Halide torch leak detector is utilized in much the same manner as the electronic type Halogen leak detector. Precautions concerning the use of the electronic type Halogen leak detector in the presence of explosive or flammable vapors are equally applicable to the Halide torch.

(3) The exploring tube of this detector should be run over all sweat fittings, all mechanical couplings, and all valves. All portions of the system under refrigerant pressure should be methodically checked with this device.

(4) Check the refrigerant charge level (para 2-9 c (1)).

(5) Install the housing panels (para 3-23 c, 3-27 c and 3-29 c).

## 7-7. Discharging Refrigerant System

a. Remove air conditioner right-side access panel assembly (para 3-29 a).

b. Remove the air conditioner charge valve cap.

c. Attach a hose to the charge valve outlet and place the other end of the hose into a 500 ml (milliliter) graduated cylinder.

d. Discharge refrigerant by opening charge valve.

*Note.* Bleed the refrigerant slowly to prevent blowing oil out of the motor compressor assembly.

e. Remove hose from charge valve when refrigerant discharge ceases. Note the amount of oil collected in the 500 ml graduated cylinder.

## 7-8. Evacuating Refrigerant System

*Note.* Replace the filter-drier unit before evacuating and charging the refrigerant system.

a. Connect charging apparatus evacuation and charge hose (fig. 7-1) to the charge valve. Connect the vacuum pump power cord to a suitable electrical power source.

b. Open the vacuum pump shut-off valve and the vacuum control valve. Check that the

h. Disconnect the hose from the air and replace the valve

i. Disconnect the

j. Install the air panel assembly.

## 7-9. Charging Refrigerant System

*Note.* Replace the filter-drier unit before charging the refrigerant system.

a. Discharge and recharge the system according to

b. Connect the refrigerant-12 bottle control valve to evaporator control valve. Apply hose. Close the valve when system pressure is 100 mm of mercury vacuum.

*Warning:* Wear safety goggles when handling refrigerant.

c. Release the scale from the platform scale. Adjust the scale to a zero scale reading.

d. Invert the refrigerant-12 bottle and place it on the platform scale. Note the weight of the refrigerant.

*Note.* The refrigerant-12 bottle should be inverted rapidly when the refrigerant is in the inverted position. If the bottle is in a cold area, the pressure may not be sufficient to charge the refrigerant-12 bottle in 120°F).

*Warning:* Do not use an open flame or apply heat to the

e. Close the vacuum control valve.

f. Shut down the vacuum pump.

g. Open the refrigerant-12 bottle.

h. Open the charge valve, and observe the pressure.

- i. Close the air conditioner charge valve.
- j. Close the refrigerant-12 bottle valve.
- k. Disconnect the evacuation and charge hose from the charge valve.
- l. Disconnect the refrigerant supply hose from the refrigerant-12 bottle, and remove the platform scale of the charging unit.
- m. Lock the platform scale beam lock.
- n. Disconnect the vacuum pump power cord from power source.
- o. Inspect the refrigerant system for leaks (para 7-6).
- p. Install the air conditioner right-side panel assembly (para 3-29 c).

## 7-10. Adding Compressor Oil

a. *General.* Oil is added to the refrigerant system only when oil is lost due to discharging the refrigerant system or replacing a major component. Oil is added after the refrigerant system is discharged and evacuated (para 7-7 and 7-8) and prior to charging (para 7-9).

b. *Adding Oil.* Using the apparatus shown in figure 7-2, add oil to the refrigerant system as follows:

- (1) Discharge refrigerant (para 7-7).

(2) Evacuate refrigerant to paragraph 7-8. step e).

(3) Place oil (FED RCO-3 Type III), in supply make up the oil needed in paragraph 7-7. step e) into the cylinder. In addition add sufficient oil to make up for a removed refrigerant system.

(4) Open oil flow control valve (2) and place dip tube into the oil cylinder. Then close oil flow control valve.

(5) Connect oil delivery hose to air conditioner charge valve.

(6) Open air conditioner charge valve.

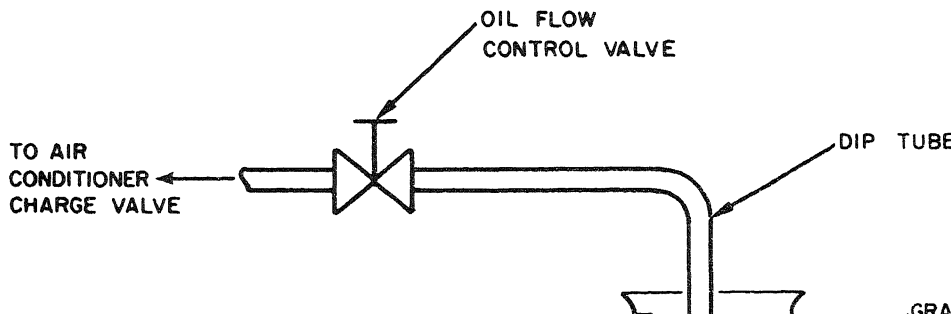
(7) Using the oil cylinder, allow sufficient oil to enter the refrigerant system to make up for lost oil. Close oil flow control valve.

*Note.* Do not permit the oil to drain below the immersed tip of the oil flow control valve, and add oil to the cylinder if required.

(8) Close air conditioner charge valve.

(9) Remove oil delivery hose from air conditioner charge valve.

(10) Evacuate refrigerant to paragraph 7-8.



## Section II. REFRIGERANT TUBING SERVICE

### 7-11. General

a. This section describes the methods used to clean and replace the refrigerant carrying tubing in the air conditioner.

b. The maintenance area should be equipped with such standard items of equipment as suitable air and electrical outlets and work benches. It is important that the maintenance area be clean and dust-free. Keep hardware and small parts together in trays to prevent them from being mislaid. Cover parts which are to stand for any period of time with clean paper or suitable coverings.

c. Discard all lockwashers, tab lockwashers, preformed packings, and composition gaskets as they are removed. When removing preformed packings, be careful not to damage the preformed packings cavities and/or adjacent surfaces involved in sealing.

### 7-12. Maintenance of Refrigerant System in Air Conditioning Unit

The refrigerant system piping must be absolutely clean and the joints properly connected in order to eliminate contamination or leakage of the refrigerant.

a. Keep all tubing sealed. When a refrigerant line is disconnected, seal it immediately with masking tape or plug it depending on the type of connection.

b. Keep all installation and servicing tools, test gauges, and replacement parts clean.

c. Do not keep the air conditioning unit open longer than necessary. When a system must be opened, the servicing tools and other

tion, ranges from C

b. *Fittings.* Brazed fittings are used at tube joints to prevent the possibility of n

### 7-14. Brazed Connections

a. *Opening a Braze.* To open a brazed joint per

(1) Discharge the refrigerant from the air conditioning unit. Purge the area around the joint to assure that any refrigerant has been expelled fr

(2) Using an air torch, heat the joint beyond the filler material.

(3) Using wire brushes or other appropriate tools, clean the joined tubes before the moisture drops below

*Caution:* Use care to immediately seal a joint to the atmosphere. This is to prevent moisture and/or dirt from entering the cycle system.

b. *Joining Braze.*

(1) Braze fittings in accordance with Military Specifications.

(2) Use class 1 brazing material as designed.

### 7-15. Flared Joints

a. *General.* The flared joint assembly with a flared tube is machined to accom

## 7-16. Maintenance of Chemical Stability in Air Conditioning System

*a. General.* In order to ensure maximum cleanliness of the air conditioning unit's internal components which, in turn, will be reflected by a higher standard of system performance, the following notations must be followed:

(1) Keep all tubing sealed. When it becomes necessary to disconnect a refrigerant line, it should be immediately sealed with masking tape or plugged depending on the type of connections. It must be remembered that all air contains moisture and air that enters any part of the system will carry moisture with it and the exposed surfaces will collect moisture quickly.

(2) Keep all installation and servicing tools, test gauges, and replacement parts clean.

(3) Use a clean dry oil container for lubrication requirements. When adding oil, the container should be exceptionally clean and dry. The oil container should be kept capped immediately after use.

(4) Do not keep the air conditioning unit open longer than necessary. When it is

necessary to open a system and other equipment to be ready for use so that minimum time is required to perform the operation.

(5) A vacuum pump should be used after performing service to remove any air that might have entered the system.

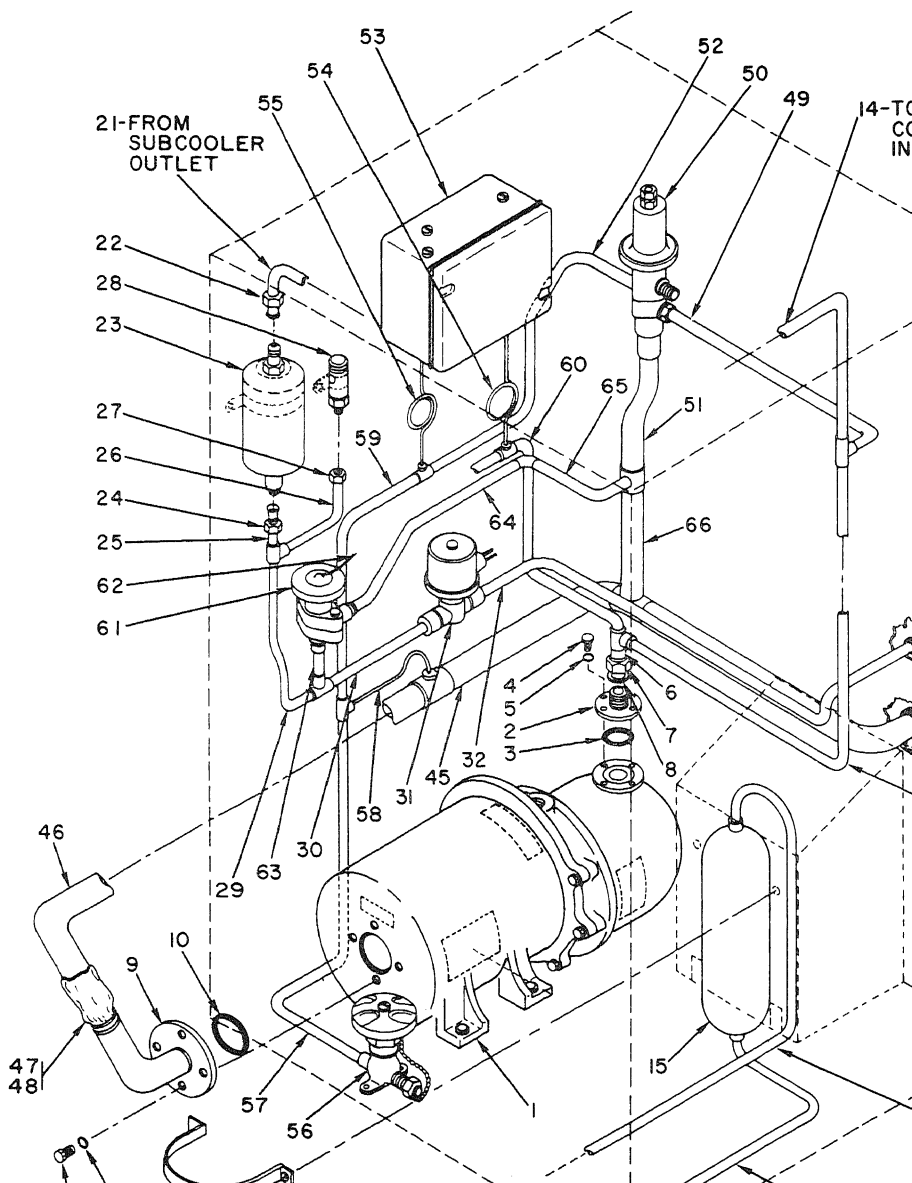
*b. Cleaning Tubing.* After the tubing has been repaired or replaced, it should be cleaned as follows: (1) The tubing should be cleaned with the following recommended:

(1) A clean, lint-free cloth should be drawn through the tubing to remove any dirt or an electrician's tape. This will remove the coarse particles of dirt.

(2) A clean, lint-free cloth should be drawn through the tubing after the carbon tetrachloride has been used. This procedure should be repeated until the saturated cloth is clean.

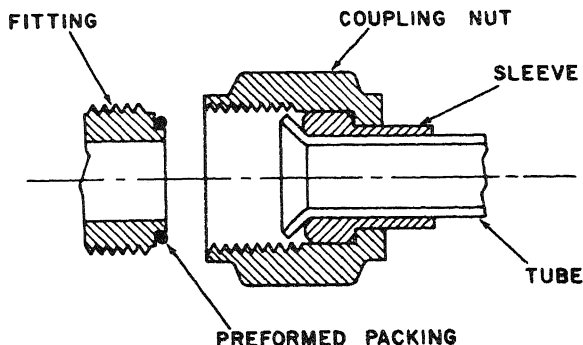
(3) A clean cloth should be drawn through the tubing after the compressor oil, squeezed through the tubing again. This procedure should be repeated until the tubing is clean. If possible, visual inspection should be made to see that tubing is clean.

(4) The cleaning procedure should be repeated until the tubing is clean. The cleaning cloth must be lintless. Any lint will cause almost a



- |                                                         |                                           |
|---------------------------------------------------------|-------------------------------------------|
| 11 Bolt (4)                                             | 40 Evaporator inlet distributor           |
| 12 Flat washer (4)                                      | 41 Evaporator outlet manifold tube        |
| 13 Compressor outlet to condenser inlet tube            | 42 Evaporator outlet tube                 |
| 14 Condenser inlet tube                                 | 43 Grommet                                |
| 15 Receiver                                             | 44 Refrigerant return thru-bulkhead       |
| 16 Screw (2)                                            | 45 Refrigerant return tube                |
| 17 Flat washer (2)                                      | 46 Compressor inlet tube                  |
| 18 Bracket                                              | 47 Insulation tubing                      |
| 19 Receiver inlet tube                                  | 48 Insulation tape                        |
| 20 Subcooler inlet tube                                 | 49 Hot gas by pass valve inlet tube       |
| 21 Subcooler outlet tube                                | 50 Hot gas by pass valve                  |
| 22 Refrigeration flare nut                              | 51 Hot gas by pass valve outlet tube      |
| 23 Filter-drier                                         | 52 Hot gas by pass valve pilot tube       |
| 24 Refrigeration flare nut                              | 53 High-low pressure switch               |
| 25 Filter-drier outlet tube                             | 54 High-low pressure switch high pressure |
| 26 Pressure relief valve inlet tube                     | 55 High-low pressure switch low pressure  |
| 27 Solder joint to straight pipe thread adapter         | 56 Charge valve                           |
| 28 Pressure relief valve                                | 57 Charge valve outlet tube               |
| 29 Filter-drier to liquid quench valve tube             | 58 Compressor inlet pilot tube            |
| 30 Solenoid valve inlet tube                            | 59 Pilot tube to low pressure pilot valve |
| 31 Solenoid valve                                       | 60 Compressor outlet to high pressure     |
| 32 Solenoid valve outlet tube                           | 61 Liquid quench valve                    |
| 33 Grommet                                              | 62 Liquid quench valve remote bulb        |
| 34 Refrigerant liquid sight indicator inlet tube        | 63 Liquid quench inlet tube               |
| 35 Refrigerant liquid sight indicator                   | 64 Liquid quench valve outlet tube        |
| 36 Thermostatic expansion valve inlet tube              | 65 Liquid quench valve and hot gas return |
| 37 Thermostatic expansion valve                         | to compressor inlet refrigerant           |
| 38 Thermostatic expansion valve remote bulb tubing      |                                           |
| 39 Thermostatic expansion valve external equalizer tube |                                           |

Figure 7-3—Continued.





the air conditioner; thus precluding the necessity of unbrazing and brazing the valve bodies from their associated air conditioner tubing.

## 7-18. Solenoid Valve

a. Discharge refrigerant system in accordance with paragraph 7-7.

b. Disassemble solenoid valve (31, fig. 7-3) in numerical sequence as illustrated in figure 7-5.

c. Reassembly solenoid valve, using new components, in reverse of numerical sequence as illustrated in figure 7-5.

d. Recharge refrigerant system in accordance with paragraph 7-8 and 7-9.

e. Check for refrigerant leakage in accordance with paragraph 7-6.

## 7-19. Liquid Quench Valve

a. Discharge refrigerant system in accordance with paragraph 7-7.

b. Disassemble liquid quench valve (61, fig. 7-3) in numerical sequence as illustrated in figure 7-6.

*Note.* Remove tape insulation and clamps, holding remote sensing bulb to refrigerant return tube (45, fig. 7-3) and remove bulb and its associated tubing with valve power head.

c. Reassemble liquid quench valve, using new components, in reverse of numerical sequence as illustrated in figure 7-6.

d. Clamp, insulate and tape remote sensing bulb to refrigerant return tube (45, fig. 7-3) and clamp remote sensing bulb tubing, using existing clamps.

e. Recharge refrigerant system in accordance with paragraphs 7-8 and 7-9.

d. Recharge refrigerant system in accordance with paragraph 7-9.

e. Check for refrigerant leakage in accordance with paragraph 7-6.

## 7-21. Thermostatic Expansion Valve

a. Discharge refrigerant system in accordance with paragraph 7-7.

b. Disassemble thermostatic expansion valve (37, fig. 7-3) in numerical sequence as illustrated in figure 7-7.

*Note.* Remove tape insulation and clamps, holding remote sensing bulb to evaporator (45, fig. 7-3) and remove bulb with power head.

c. Reassemble thermostatic expansion valve, using new components, in reverse of numerical sequence as illustrated in figure 7-7.

d. Clamp, insulate and tape remote sensing bulb to evaporator (45, fig. 7-3) and clamp remote sensing bulb tubing, using existing clamps.

e. Recharge refrigerant system in accordance with paragraphs 7-8 and 7-9.

f. Check for refrigerant leakage in accordance with paragraph 7-6.

## 7-22. Pressure Relief Valve

a. Discharge refrigerant system in accordance with paragraph 7-7.

b. Remove pressure relief valve (45, fig. 7-3) and replace with new valve in accordance with paragraph 7-6.

b. Disassemble valve so that only the valve body is connected to its associated tubing.

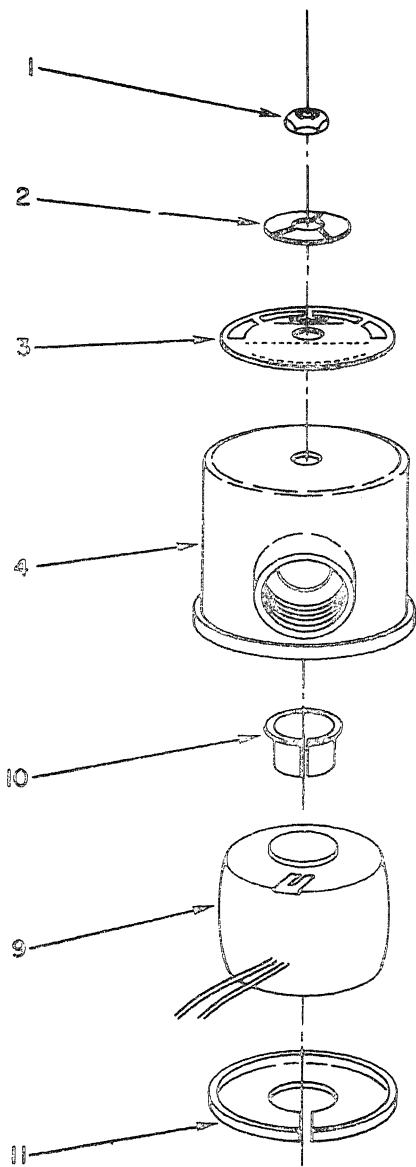
c. Unbrazed valve body in accordance with paragraph 7-14a.

d. Install a new valve body in accordance with paragraph 7-14b.

e. Reassemble valve.

f. Charge refrigerant system with paragraphs 7-8 and 7-9.

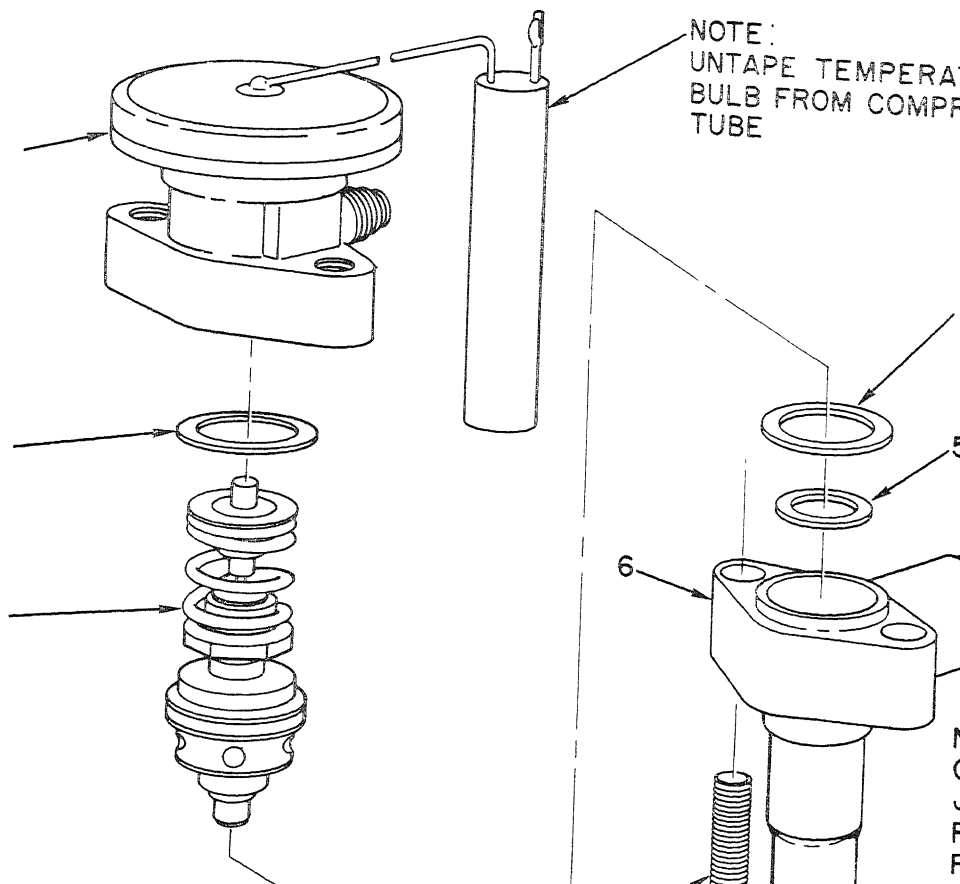
g. Check for refrigerant leakage in accordance with paragraph 7-6.



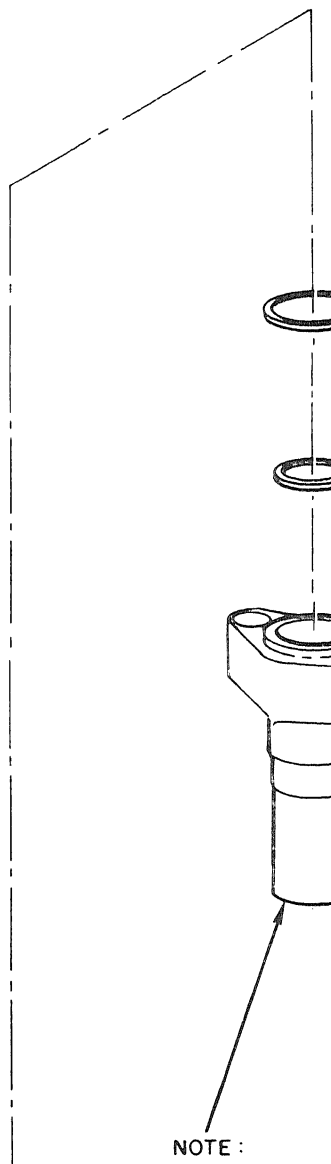
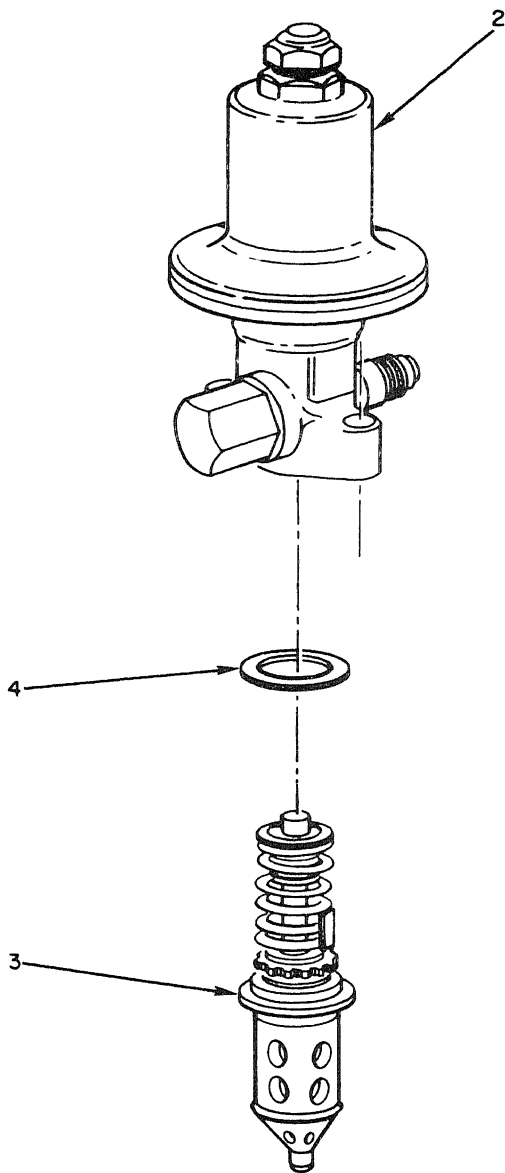
- 1 Coil housing nut
- 2 Coil name plate
- 3 Valve name plate
- 4 Coil housing assembly
- 5 Union nut
- 6 Enclosing tube assembly

- 7 Enclosing tube-to-body gasket
- 8 Plunger and piston assembly
- 9 Coil assembly
- 10 Coil sleeve (2)
- 11 Coil plate
- 12 Body and seat assembly

Figure 7-5—Continued.



4120-287-15

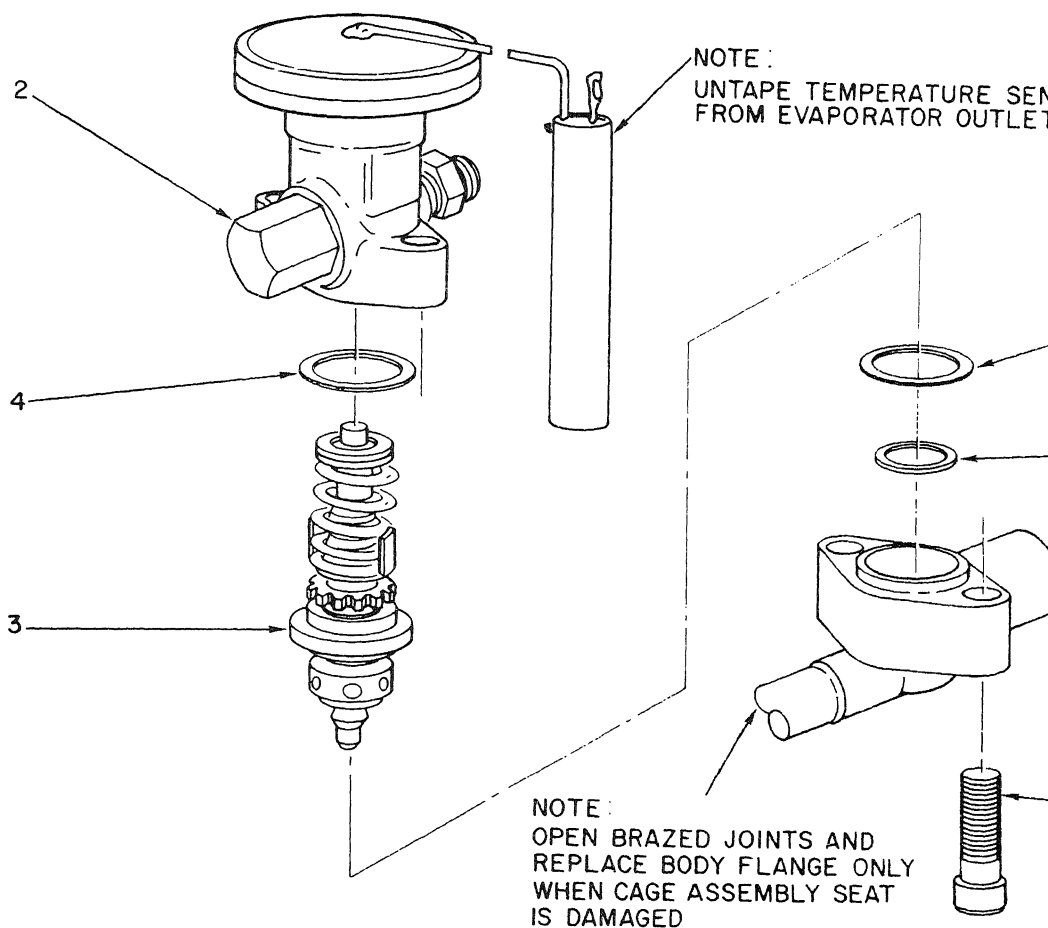


NOTE :

- 1 Body flange cap screw (2)
- 2 Body and case assembly
- 3 Cage assembly
- 4 Body flange gasket

- 5 Body flange gasket
- 6 Seat gasket
- 7 Body flange

Figure 7-7—Continued.



## **APPENDIX A**

### **REFERENCES**

---

#### **A-1. Fire Protection**

TB 5-4200-  
200-10      Hand Portable Fire Extinguishers For Army Users

#### **A-2. Painting**

TM 9-213      Painting Instructions for Field Use

#### **A-3. Maintenance**

TM 38-750      Army Equipment Record Procedures  
TM 5-764      Electric Motor and Generator Repair  
TM 5-4120-  
287-25P      Organizational, DS, GS, & Depot Maintenance Repair  
Tool List

#### **A-4. Shipment and Storage**

TB 740-93-2      Preservation of USAMEC Mechanical Equipment for  
age  
TB 740-93-3      Administrative Storage of USAMEC Mechanical Equipment

## APPENDIX B

### BASIC ISSUE ITEMS LIST

---

#### Section I. INTRODUCTION

##### B-1. Scope

This appendix lists items which accompany the air conditioner or are required for installation, operation, or operator's maintenance.

##### B-2. General

This Basic Issue Items List is divided into the following sections:

*a. Basic Issue Items — Section II.* A list of items which accompany the air conditioner or are required for the installation, operation, or operator's maintenance.

*b. Maintenance and Operating Supplies — Section III.* A listing of maintenance and operating supplies required for initial operation. (NOT APPLICABLE)

##### B-3. Explanation of Columns

The following provides an explanation of columns in the tabular list of basic issue items, section II.

*a. Source, Maintenance, and Recoverability Codes (SMR), Column (1).*

(2) Maintenance Co  
lowest category of maintenance  
install the listed item.

Code	Expl
C	Operator/crew
O	Organizational maintenance

(3) Recoverability Co  
er unserviceable items shown  
recovery or salvage. Item  
pendable.

*b. Federal Stock Number*  
This column indicates the  
ber for the item.

*c. Description, Column*  
indicates the Federal item  
ditional description of the  
part number or other r  
followed by the applicable  
supply code for manufacture  
Repair parts quantities in  
and assemblies are shown  
pair part name.

*d. Unit of Issue, Column*  
indicates the unit used a  
e.g., ea, pr, ft, yd, etc.



or to obtain as required. As required items are indicated with an asterisk.

i. *Illustration, Column (9).* This column is divided as follows:

(1) *Figure Number, column (9)(a).*

Indicates the figure in which the item is shown.

(2) *Item Number.* Indicates the callout number of the item in the illustration.

## Section II. BASIC ISSUE ITEMS

(1) SMR code	(2) Federal stock number	(3) Description	(4) Unit of issue	(5) Qty inc in unit pack	(6) Qty inc in unit
PC		GROUP 31—BASIC ISSUE ITEMS MANUFACTURER INSTALLED			
		3100—BASIC ISSUE ITEMS— MANUFACTURER OR DEPOT INSTALLED			
PC	7520-559-9618	CASE MAINTENANCE AND OP- ERATIONAL MANUAL: Cotton duck, water repellent, mildew re- sistant	--	--	--
PC		DEPARTMENT OF THE ARMY OPERATOR, ORGANIZATION- AL, DIRECT AND GENERAL SUPPORT AND DEPOT MAIN- TENANCE MANUAL TM 5-4120-287-15	--	--	--
		3200—BASIC ISSUE ITEMS, TROOP INSTALLED OR AUTHORIZED			
PO	4130-860-0042	OIL, FILTER: Water soluble	--	--	--
PO	8040-273-8717	ADHESIVE: 1 pt can	--	--	--

## APPENDIX C

### MAINTENANCE ALLOCATION CHART

---

#### Section I. INTRODUCTION

##### C-1. General

a. This section provides a general explanation of all maintenance and repair functions authorized at various maintenance levels.

b. Section II designates overall responsibility for the performance of maintenance functions on the identified end item or component. The implementation of the maintenance functions upon the end item or component will be consistent with the assigned maintenance functions.

c. Section III lists the special tools and test equipment required for each maintenance function as referenced from Section II.

d. Section IV contains supplemental instructions, explanatory notes and/or illustrations required for a particular maintenance function.

##### C-2. Explanation of Columns in Section II

a. *Group Number, Column (1).* The functional group is a numerical group set up on a functional basis. The applicable functional grouping indexes (obtained from TB 750-93-1. Functional Grouping Codes) are listed on

tions for the various maintenance functions are as follows:

- C — Operator or crew
- O — Organizational maintenance
- F — Direct support maintenance
- H — General support maintenance
- D — Depot maintenance

The maintenance functions are as follows:

- A—Inspect. To determine the condition of item by comparing with visual, mechanical, and electrical standards, and established standards.
- B—Test. To verify serviceability of electrical or mechanical components of test equipment.
- C—Service. To clean, tune, lubricate, repaint, and to replace cooling agents, and other consumables.
- D—Adjust. To rectify electrical or mechanical malfunctions to bring into proper operating condition.
- E—Align. To adjust the alignment of an item to meet performance requirements.

H—Replace. To replace unserviceable items with serviceable assemblies, subassemblies, or parts.

I—Repair. To restore an item to serviceable condition. This includes, but is not limited to, inspection, cleaning, preserving, adjusting, replacing, welding, riveting, and strengthening.

J—Overhaul. To restore an item to a completely serviceable condition as prescribed by maintenance serviceability standards using the Inspect and Repair Only as Necessary (IROAN) technique.

K—Rebuild. To restore an item to a standard as nearly as possible to original or new condition in appearance, performance, and life expectancy. This is accomplished through complete disassembly of the item, inspection of all parts or components, repair or replacement of worn or unserviceable elements (items) using original manufacturing tolerances and specifications, and subsequent reassembly of the item.

*d. Tools and Equipment, Column (4).* This column is provided for referencing by code the special tools and test equipment, (sec. III) required to perform the maintenance functions (sect. II).

*e. Remarks, Column (5).* This column is provided for referencing by code the remarks (sect. IV) pertinent to the maintenance functions.

### C-3. Explanation of C

*a. Reference Code.* of a number and a letter. The number references the maintenance column on the chart. The letter represents the specific maintenance item to be used with the maintenance column. Representative of columns A through K.

*b. Maintenance Level.* the lowest level of maintenance. To use the special tool or equipment.

*c. Nomenclature.* The name or identification of the equipment.

*d. Tool Number.* The manufacturer's code and Federal Stock Number of the tool or equipment.

### C-4. Explanation of C

*a. Reference Code.* of two letters separate from the maintenance column. The first letter references the maintenance column, A through K.

*b. Remarks.* This column is pertinent to the maintenance functions performed, as indicated by the maintenance column. II.

(1) Group No.	(2)  Functional group	(3) Maintenance functions								
		A	B	C	D	E	F	G	H	I
		Inspect	Test	Service	Adjust	Align	Calibrate	Install	Replace	Repair
22	BODY, CHASSIS OR HULL AND ACCESSORY ITEMS									
2210	Data Plates: Plates data -----	O	--	--	--	--	--	F		
40	ELECTRIC MOTORS									
4000	Motor Assembly: Motor evap fan -----	--	F	--	--	--	--	F	H	
4018	Terminal Block: Clamps; connectors and grommets ----- Receptacle, remote control ---	F O	F --	-- --	-- --	-- --	-- --	F F		
42	ELECTRICAL EQUIPMENT									
4202	Electrical Controls: Tray, electrical ----- Control Box, remote -----	F O	F O	-- --	-- --	-- --	-- --	F O	F O	
4203	Circuit Breakers, Fuse and Fuse Holders: Fuseholder ----- Circuit breakers ----- Switches, reset & overheat -- Relays -----	O F -- -- --	-- F F F F	-- -- -- -- --	-- -- -- -- --	-- -- -- -- --	-- -- -- -- --	O F F F F		
4205	Control Resistances: Resistor, variable -----	--	O	--	O	--	--	O		
4211	Power Receptacles: Main power receptacle -----	F	F	--	--	--	--	F		
4212	Heating Units: Heater elements -----	F	F	--	--	--	--	F		
4213	Non-Rotating Rectifiers: Converters: Rectifier ----- Power transformer -----	-- -- --	F F --	-- -- --	-- -- --	-- -- --	-- -- --	F F F		
4216	Miscellaneous Wiring and Fittings: Wiring harness ----- Wiring harness remote -----	F O	F O	-- --	-- --	-- --	-- --	F O		

(1)  Group No.	(2)  Functional group	(8) Maintenance functions								
		A	B	C	D	E	F	G	H	I
		Inspect	Test	Service	Adjust	Align	Calibrate	Install	Replace	Repair
5241	Evaporator: Evaporator assembly -----	F	F	O	--	--	--	F	F	
5243	Blower Assembly: Fan assemblies -----	F	F	--	--	--	--	F	H	
5244	Thermostatic Controls: Thermostat -----	--	O	--	--	--	--	O		
5245	Air Filters: Clip, mounting ----- Filter ----- Mist eliminator -----	O O F	-- -- --	-- O F	-- -- --	-- -- --	-- -- --	-- O F	O O F	

### Section III. SPECIAL TOOL AND SPECIAL TEST EQUIPMENT REQUIREMENTS

Reference code	Maintenance level	Nomenclature
1-J	D	Holding fixture (96193) HF26664-T-11 Torque adapter (96193) TA26664-T-10 Holding fixture (96193) HF22395-T-3 Press rod (96193) PR26664-T-4 Press tool (96193) PT26664-T-2 Holding fixture (96193) HF26664-T-1 Holding fixture (96193) HF26664-T-3 Torque adapter (96193) TA26664-T-9

### Section IV. REMARKS

Reference code	Remarks
A-1	Straighten weld or patch pierced panels
B-1	Replace gasket or insulation

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    Flared joints -----

    Housing panels -----

    Maintenance of chemical stability in air conditioning system -----

    Motors and heater repair instructions -----

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